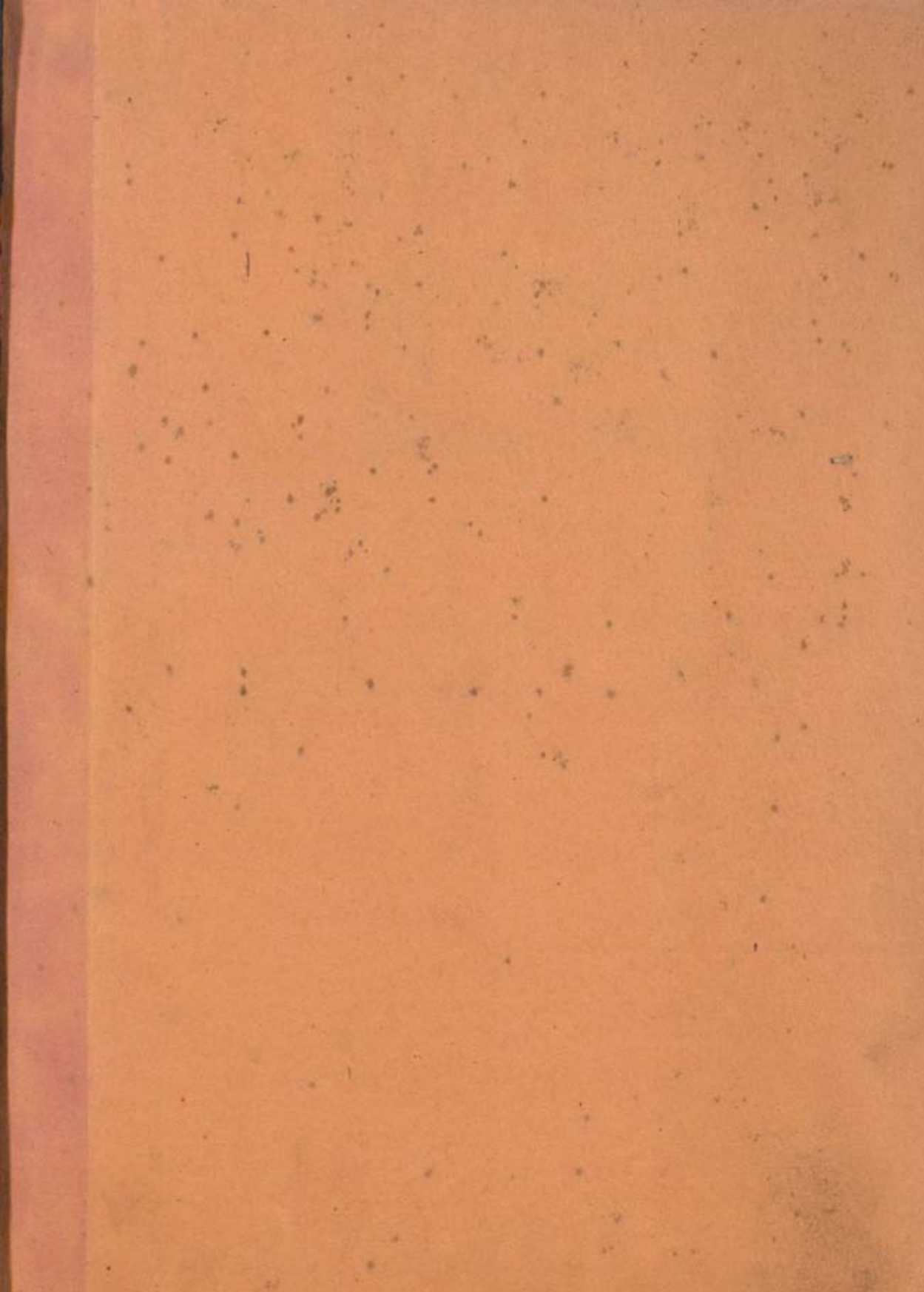


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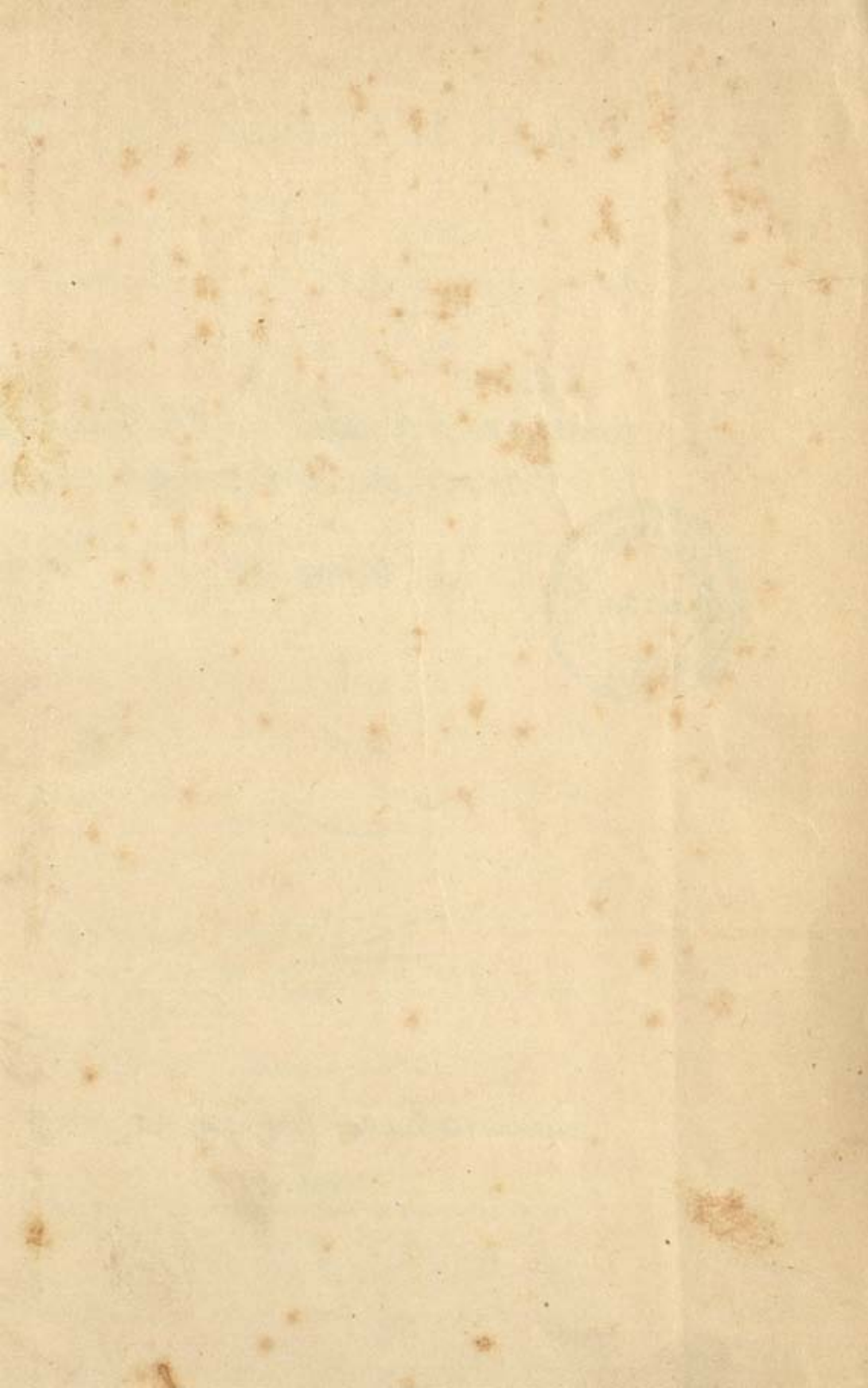
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Vol 2

INDIAN MEDICINAL PLANTS



BY

Lieutenant-Colonel K. R. KIRTIKAR, F.L.S., I.M.S., (Retired),

D3024

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AND

I.C.S. (Retired).



27240

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Kir / Bas

Published by

SUDHINDRA NATH BASU, M.B.

PÂNINI OFFICE, BHUWANEŚWARI ÂSRAMA, BAHADURGANJ,

Allahabad

PRINTED BY APURVA KRISHNA BOSE, AT THE INDIAN PRESS

1918

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PREFACE.

BEFORE the completion of Sir Joseph Hooker's great book 'Flora of British India,' the only comprehensive work on Indian Botany was that of Dr. W. Roxburgh. But it was long out of print and the Revd. Dr. Carey's edition of that important work sold in London for something like £5. The late Mr. C. B. Clarke of the Educational Department of Bengal, afterwards Inspector of Schools in Assam, conferred a great boon on students of Indian Botany by bringing out a reprint of that work in 1874 and pricing it so low as 5 rupees only. Unfortunately, it is now out of print. When more than 25 years ago, I commenced the study of Indian Medicinal Plants, I had to work with this well known book. So the reference to Roxburgh throughout the present work is to the pages of that reprint.

I also experienced great difficulty in identifying the plants for not possessing illustrations of most of them. It is almost impossible for a person of moderate resources to provide himself with all the illustrated works on Indian Botany, especially as a good many of them, having become out of print, are procurable only at fabulous prices. I found that for a proper study of the subject there was a great want of a work containing illustrations, botanical descriptions, vernacular names and uses of the medicinal plants of this country. It was to supply this want to some extent that the present work was undertaken. In this undertaking I was very fortunate to have secured the co-operation of the late lamented Lieutenant-Colonel Kanhoba Ranchoddas Kirtikar, F. L. S., I. M. S., a botanist of great repute, who possessed a very rich library of Botany and other sciences allied to it. Himself a good draughtsman, he had also employed an able artist of Bombay to draw and paint from nature, plants of economic importance. The faithfulness of these drawings is admired by those who have seen them. Colonel Kirtikar very readily allowed me to publish them with this work. He also kindly undertook to prepare the botanical descriptions of the

plants, and was helped in this portion of his task by an able member of the Indian Civil Service, who to his other accomplishments adds a great taste for Botany. His notes have been incorporated by Colonel Kirtikar in the botanical descriptions.

Before his lamented death, which took place on the 9th May, 1917, Colonel Kirtikar had left in manuscript the botanical descriptions of almost all the plants mentioned in this work. It is to be greatly regretted that he did not live to give a finishing touch to his writings. He was, however, able to revise the proofs of about the first 500 pages of this book.

When we undertook the preparation of this work, it was decided that it would not be a treatise on *Materia Medica*. A work of that nature should include—

“(1) Characters and means of recognition of the crude drug including—

(a) External appearance, feel, [taste], smell, weight, &c.

(b) Microscopical characters and tests.

(c) General adulterants and mode of detection.

(2) To know whence and how the drug is obtained.

(3) The general properties of the crude drug, and the source of its special properties, *i.e.*, its active principle, treated generally.

(4) To know the method of development of the drug itself, so far as practicable; and the nature, anatomical and developmental, of the structures whence it is obtained.

(5) The preparations in which the drug forms a part, the processes of preparation and their *rationale*; methods of manipulation, etc.

(6) The doses of the drug and of its preparations.

(7) The physiological action of the drug and its preparations.”

Pharmacographia Indica by Messrs. Dymock, Warden and Hooper still remains an authoritative work on Indian *Materia Medica*. The present work is a Botany of Indian Medicinal Plants and so no account of drugs procurable in Indian bazars is given in it.

It is true that most of the illustrations in this publication are reproductions from those in various works on Indian Botany and

other standard works on the subject. This, we submit, should not be considered in any way to lessen the importance of the work. It has been truly observed by an eminent writer :—

“Exaggerated individual energy and independence have become conceit....

“The chief business with him (a young man) is not to work well, but to work in a different mode to others; originality is more to him than beauty. This idea which now-a-days has such a strong hold on all heads, even the most empty, reminds us of that graceful epigram of Goethe's on originals. A certain person says, ‘I do not belong to any School, there exists no living master from whom I would take lessons, and as to the dead, I have never learnt any thing from them,’ which, if I am not mistaken, means, ‘I am a fool on my own account.’ What else is this extravagant desire for originality, but, as we have said, an exaggeration of individual energy, a want of equilibrium, the sin, in fact, of pride? ” *

Dr. Garnett writes :—

“The truly artistic production, *** may well outlast the inferior work * * as the diamond survives the glass which it engraves.” †

The illustrated works on Indian Botany of such well-known masters of the subject, as Rheede, Roxburgh, Royle, Burman, Brandis, Beddome, Griffith, Wallich, Wight and several others, are not easily accessible to those who are interested in the study of the subject. It is, therefore, that their illustrations have been copied and supplemented, where necessary, by further details.

I was in charge of the Indigenous Drugs Court of the United Provinces Exhibition held at Allahabad in December 1910 and January and February 1911. One of the special features of the Indigenous Drugs Court was the exhibition of herbarium specimens and of drawings of almost all the known plants used in medicine in this country. I collected drawings from the illustrated works on Indian Botany and other standard works on that subject available in the United Provinces. The late Dr. E. G. Hill lent to the exhibition the illustrated works on Botany from the Allahabad Public Library of which he was the Secretary. The President and the Imperial Forest Botanist of the Forest Research Institute of Dehra Dun were kind enough to lend illustrated books on Botany which were not to be had at Allahabad. The late Lieutenant-Colonel Kirtikar,

* “The Decadence of Modern Literature by Armando Palacio Valdes of Madrid in the International Library of Famous Literature, Vol. xx

† “The use and value of Anthologies,” in the International Library of Famous Literature, Vol. I.

F.L.S., I.M.S., (Retd.) very kindly lent the paintings already referred to above to the exhibition.

But still I was unable to secure illustrations of about 300 Indian Medicinal Plants for the Exhibition. I wrote to the Superintendent, Royal Botanical Garden, Shibpur, Calcutta, if he would kindly lend the drawings of those plants from the Herbarium in his charge. In his letter dated 24th May, 1910, he wrote :—

"I regret that I cannot see my way to let you have a loan of the original drawings of any plants, as it is a strict rule in all botanical institutions that original drawings are not allowed to go out of the building for any purpose, as in the event of loss or damage they could not possibly be replaced. I should however be quite prepared to have exact copies made of such drawings as may be of interest to you at the expense of the Exhibition. For large full size drawings coloured, the rate for copying including paper would be Rs. 5-8-0 each."

About this time, I made the acquaintance of Professor Bhim Chandra Chatterji, B.A., B.Sc., then of the Bengal Technical Institute, Calcutta. I was told that he had collected materials and illustrations of plants of Hindu Materia Medica, as he was preparing a work on that subject. So I wrote to him to exhibit his collection at the Exhibition. He came to Allahabad to see me. On showing him the letter of the Superintendent, Shibpur Garden, he said he would take photos of those plants and their drawings which would cost less than one-fifth of the estimate given in the letter referred to above.

I went to Calcutta and taking Professor Bhim Chandra Chatterji introduced him to the Superintendent, who very kindly afforded him every facility to take photos of plants and of their drawings. But, unfortunately, Professor Bhim Chandra Chatterji was not successful with his photographs. He then arranged with the Shibpur artists to copy the drawings of plants preserved in the Herbarium there at very favourable terms.

The late lamented Mr. G. R. Murray, I.C.S., who was Secretary of the United Provinces Exhibition, took great interest in the Indigenous Drugs Court and did all that lay in his power to make it a success. He got his committee to sanction the sum necessary to procure copies of drawings of the plants. After

closure of the Exhibition, while he was acting as Registrar of the High Court, Allahabad, he enquired several times about the progress in printing of the present work, more especially of the plates, thus showing his interest in this publication.

Over 300 drawings were copied in about five months. Professor Bhim Chandra Chatterji had little time to compare the copies with the originals and was, therefore, unable to vouch for their accuracy. Details of several drawings, especially those made from type specimens, had to be completed. So in December 1911 I went down to Calcutta and compared the copies of the drawings with the originals. Owing to pressure of work at Allahabad, I could not prolong my stay in Calcutta. So several plates were left at Shibpur for details to be filled in. Colonel Gage, I.M.S., obliged me by getting this done. In his letter dated 29th March 1912, in returning the drawings he wrote :—

"I return herewith the drawings you sent for filling in the details of the dissections. They have been gone over by Mr. Ramaswamy and checked in every case. It has not always been possible to get precise dissections from the Herbarium specimens, as in the case where there is one specimen we cannot afford to dissect it. I trust however what has been done will prove to your satisfaction."

He has placed us under deep obligation by permitting us to copy and publish some of the original drawings by Roxburgh preserved in the Herbarium in the Royal Botanical Garden Shibpur, and to reproduce some of the illustrations given in the Annals of it, and also to have drawings made from the type specimens in that Herbarium, of some of the plants not to be found in publications kept in the library of that institution.

Our thanks are due to Mr. R. S. Ho'le, F.C.H., F.L.S., I.F.S., Forest Botanist of Dehra Dun, for his kind permission to copy and publish some of the original drawings of plants prepared by Mr. J. F. Duthie, B.A., F.L.S., late Director of Botanic Survey, Northern India.

We are thankful to the publishers of Curtis's Botanical Magazine and of Bentley and Trimen's Medicinal Plants for permission to copy some of the illustrations from their publications; as also to the Government of the United Provinces of Agra and Oudh for allowing us to copy a few illustrations from the Field

and Garden Crops of the North Western Provinces prepared by Mr. Duthie and Mr., now Sir Bampfylde, Fuller.

The Government of India, the Missouri Botanical Garden, the Agricultural Bureau and the Smithsonian Institution of America, as well as the Board of Agriculture of England, have greatly helped us in the preparation of this work by their supplying us with some of their publications bearing on the subject.

Some of those works on Botany which were not in the library of the late Colonel Kirtikar were very kindly lent to us by Colonel Gage from the Library of the Royal Botanic Garden, Shibpur; by the late Mr. Harinath De, M.A., I.E.S., from the Imperial Library, Calcutta, of which he was the librarian; and by Mr. Hole from the Library of the Imperial Forest Research Institute, Dehra Dun. To all these gentlemen, our best thanks are due.

Colonel Gage also very kindly gave instructions to the members of the staff serving under him to assist us in every way in their power in the preparation of this work. The late Mr. M. S. Ramaswami M.A., and Babu Sashi Bhushan Banerji were of great help to us.

Professor Bhim Chandra Chatterji, was advertised as one of the joint authors of this work. But his portion of the work not being ready, it is regretted it has not been published with this.

My best thanks are due to Babu Chintamani Ghosh, the enterprising proprietor of the well-known Indian Press, who has taken great interest in and trouble for this work. He deputed his talented artist, Mr. Sommer, to Europe to fetch large-sized lithographic stones and art-paper for its printing. Without his help and supervision, it would have been impossible to bring out the work in its present get-up, which has exceeded my expectations.

The enlightened Maharaja Bahadur of Cossimbazar, the Hon'ble Sir Manindra Chandra Nandy, K. C. I. E., with his accustomed munificence, has contributed ten thousand rupees to meet a portion of the expenses incurred in the production of this work. Our heartiest thanks are due to him for this handsome donation.

ALLAHABAD :

B. D. BASU.

1st January, 1918.

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INTRODUCTION.

I.

Since disease, decay and death have always co-existed with life, the study of diseases and their treatment must also have been contemporaneous with the dawn of the human intellect. The primitive man must have used as therapeutical agents and remedial measures those things which he was able to procure most easily. There is no authentic record of medicines used by the primitive man. But the *Rig Veda* which is the oldest book in the library of man supplies curious information on the subject. From it, we learn that the Indo-Aryans used the *Soma* as a medicinal agent. It is not quite certain what the *Soma* * plant was.

*Dr. Aitchison has lately stated that *Soma* must be the *Ephedra pachyclade*, which in the Harirud valley is said to bear the name of *hum*, *huma*, and *Yahma*. This supposition is confirmed by Dr. Joseph Barumüller, a botanist long resident in Kerman, who identifies the *Soma* plant with some kind of *Ephedra*, probably *Ephedra distachya*, but who remarks that different varieties of *Ephedra* are to be found from Siberia to the Iberian peninsula, so that one must give up the hope of determining the original home of the Aryas by means of the habitat of the *Soma* plant, (Quarterly Review, No. 384, Oct. 1894, p. 455).

The *Soma* plant possessed intoxicating properties and the Vedic Aryans recognised it as a quickener of the intellect. 'Soma, like the sea, has poured forth songs, and hymns, and thoughts.' **

'The beverage (i.e., *Soma* juice) is divine; it purifies, it inspires joy, it is a water of life;.....it gives health and immortality.'

"We've quaffed the *Soma* bright,
And are immortal grown;
We've entered into light,
And all the gods have known.
What mortal now can harm,
Or foeman vex us more?
Through thee, beyond alarm,
Immortal god, we soar."

Address to *Soma*.

"Thou *Soma*, fond of praise, the lord of plants, art life to us."

"Be unto us, *Soma* the bestower of wealth, the remover of disease,
Exulting *Soma*! increase with all twining plants."

"I invoke the divine waters, in which our cattle drink:

Ambrosia is in the waters; in the waters are medicinal herbs."

Soma is supposed to preside over medicinal herbs, and therefore the Rishi Medhatithi continues his hymn, as:—

"*Soma* has declared to me, 'all medicaments as well as Agni, the benefactor of the Universe, are in the waters;' the waters contain all healing herbs.

This plant has not yet been satisfactorily identified. The Indo-Aryans used the plant for sacrificial purposes and its juice is described in the ancient Aryan literature as a stimulating beverage. The word ओषधि (oshadhi) literally means heat-producer. When the Indo-Aryans came to use the *Soma* plant for therapeutical purposes, they came to possess a knowledge of the medicinal properties and uses of herbs and plants. Hence, *Oshadhi* (ओषधि) applied to all herbs and medicinal plants.

The knowledge of medicinal plants must have been accumulated in the course of many centuries. In his work on *Plants and Animals under Domestication*, Darwin says :—"From innumerable experiments made through dire necessity by the savages of every land, with the result handed down by tradition, the nutritious, stimulating and medicinal properties of the most unpromising plants were probably first discovered."*

The "doctrine of signatures" would also account for the use of several plants as medicinal agents. This doctrine is based on the resemblance in shape or color of some product of the vegetable kingdom with some organ in the animal economy. In the ignorance of anatomical or physiological data to work upon the primitive man thinks that these articles possess some action on those organs which they resemble in shape, size or color. Again, another reason for the extensive use of vegetable drugs may be the fact that plants are everywhere at hand, their number is very great and their forms are distinct and peculiar and thus are procured without trouble.

It is greatly to the credit of the people of India that they were acquainted with a far larger number of medicinal plants

"Waters bring to perfection all disease,—dispelling medicaments for (the good of) my body, that I may long behold the sun.

"Waters take away whatever sin has been (found) in me, whether I have (knowingly) done wrong or have pronounced imprecations (against holy men) or (have spoken) untruth.

"I have this day entered into the waters: we have mingled with their essence." (Wilson's translation of the *Rig. Veda*, Vol. I, p. 57).

"Thou, *Soma*, fond of praise, the lord of plants, art life to us."

"Be unto us, *Soma*, the bestower of wealth, the remover of disease, Exulting *Soma*! increase with all twining plants." (Ibid p: 234).

* Vol. I, p. 325.

than the natives of any other country on the face of the earth. The vegetable *Materia Medica* of the Greeks, Romans, Egyptians, Jews, Babylonians, Persians, Chinese and Arabs does not display such an extensive knowledge of medicinal plants and drugs as does any of the authoritative medical works of the Hindus. The knowledge of herbs possessed by the aborigines of America, Australia or Africa, is also not very great. Regarding the medicinal agents of the American Indians, Mr. B.-F. Stacey says :—

“From a thorough investigation I am convinced that the list is not lengthy, and that there is but little to be learned from their school of practice or repertoire of medicinal agents.”*

Mr. J. N. Rose, in his “Notes on Useful Plants of Mexico.” says :—

“The country people and Indians seem to have but little knowledge of medicine, generally using teas made of bitter and strong-smelling herbs.”

Mr. J. H. Maiden writes in his “Useful native plants of Australia.” (Pp. 146-147) :—

“In fairness to ourselves we must confess ourselves very little indebted to the Australian aboriginal for information as to the medical (or in fact any other) properties of our plants. The poor aboriginal chiefly takes interest in the vegetation as supplying him with his scanty food, or as affording him fibre useful in securing fish and other animal substance. As far as we know, the *Materia Medica* of the blacks is of a very meagre description, yet the acquisition of even such little knowledge as they are supposed to possess has been slow and difficult, inasmuch as persons who have lived in a state of nature with them have not been distinguished for either their medical or botanical knowledge.”

He has very truly observed :—

“With the native *Materia Medica* of India, for instance, the case is very different. While some remedies are evidently used fancifully, and others for every disease to which the human

* The Ph. J. of May, 30, 1874, p. 958.

frame is liable, much of the knowledge in regard to it is exact, the outcome of intelligent observation and enquiry, * * *

It may be that much of the knowledge of plants, once possessed by the ancestors of the present aborigines, has become lost to the world owing to their ignorance of the art of writing.*

But we should not treat with contempt the knowledge of herbs possessed by aborigines. There can be little doubt that their "medicine men" possess a remarkably accurate knowledge of the medical uses of the plants around them. We should remember that they have taught us the uses of some of our most important drugs. It is to them that we are indebted for our knowledge of *Cinchona* in malaria, *Digitalis*, *Strophanthus* and *Physiostigma* in heart diseases, and of *Quassia* as a bitter tonic. We cannot, therefore, sufficiently admire the practical wisdom of the ancient Hindus when they enjoined on the votaries of the healing art the penetration forests and the climbing of mountains to examine the qualities and properties of the medicines in their natural situations, and gather information regarding them from hunters and shepherds who may have had opportunities of witnessing their effects.†

* Writing of America one botanist says that "when our forefathers came to this country they found the natives in possession of much medical knowledge of plants. Having no remedies prepared by scientific skill, the Indians were led, by necessity, to the use of those which nature afforded them; and, by experience and observation, they had arrived at many valuable conclusions as to the qualities of plants. Their mode of life, leading them to penetrate the shades of the forest, and to climb the mountain precipices, naturally associated them much with the vegetable world. The Indian woman, the patient sharer in these excursions, was led to look for such plants as she might use for the diseases of her family. Each new and curious plant, though not viewed by her with the eye of a botanist, was regarded with scrutinizing attention: the colour, taste, and smell were carefully remarked, as indications of its properties. But the discoveries and observations of the Indians have perished with themselves; having had no system for the classification or description of plants, nor any written language by which such a system might have been conveyed to others, no other vestige remains than uncertain tradition of their knowledge of the medicinal qualities of plants."

† That much of the knowledge of medicinal plants by the primitive man was obtained from hunters and shepherds is evident from what Dr. Raymond Crawford, M.A., M.D., (Oxon), Physician to King's College Hospital, London said in his presidential address delivered before the section of the History of Medicine, reported in the *Lancet* from which it has been reproduced in the *Scientific American Supplement* of April 14 and 21, 1917.

"Man, doubtless, will have acquired much of his knowledge of the nutritive and medicinal value of plants by the same method as the lower animals, by experience. Like them, too, he will have profited by imitation, and imitation embracing his observation of the habits of the lower animals. It must have been of immense importance to man, when he depended largely

About a generation ago, the use of plants and herbs as remedial agents was greatly discredited. The late Sir Thomas Lauder Brunton drew an analogy between the weapons and tools employed in art or warfare, and the implements used by man in the treatment of disease in different ages. It is customary to divide the progress of civilization into four stages, characterized by the nature of the weapons employed. "In the first or Paleolithic age, man employed weapons or tools of flint roughly chipped into shape and unpolished. In the next or Neolithic age, the implements consisted of stone, but they were polished. The next age is characterized by the employment of bronze as a material, and the fourth and highest stage by the employment of iron. * * * In the same way, we may recognise four stages in the development of the implements in the treatment of disease. In the first stage crude drugs were employed, prepared in the roughest manner, such as powdered Cinchona or metallic antimony. In the next stage, these were converted into more active and more manageable forms, such as extracts or solutions, watery or alcoholic. In the third stage, the pure active principles, separated from the crude drugs, were employed, *e.g.*, morphine and quinine. In the fourth stage, instead of attempting to

for food on wild animals captured in the chase, to watch them closely so as to know their habits. * * *

"That a good deal of man's medicinal knowledge arose accidentally in his efforts to extend the range of his food supply is suggested by the prominent place occupied by food—stuffs in primitive pharmacy".

The ancient Hindus should be given the credit for cultivating what is now called "Ethno-botany". In Bulletin 55 of the Bureau of American Ethnology, it is said :—

"Ethnobotany is virtually a new field of research, a field which, if investigated thoroughly and systematically will yield results of great value to the ethnologist and incidentally also to the botanist. * * *

Ethnobotanical research is concerned with several important questions :—
(a) What are primitive ideas and conceptions of plant life ? (b) What are the effects of a given plant environment on the lives, customs, religion, thoughts and everyday practical affairs of the people studied ? (c) What use do they make of the plants about them for food, for medicine, for material culture, for ceremonial purposes ? (d) What is the extent of their knowledge of the parts, functions, and activities of plants ? (e) Into what categories are plant names and words that deal with plants grouped in the language of the people studied, and what can be learned concerning the working of the folkmind by the study of these names ?

Ethnobotany will become a more important subject when its study has progressed to a point where results can be studied comparatively.

A prime necessity is a good native informant; indeed it is better to have several informants, preferably older men or women."

What a pity that hardly any attention is paid to this subject in modern India.

extract our medicines from the natural products in which they are contained, we seek to make for ourselves such substances as shall possess the particular action we desire.”*

This method had been pursued since the time when Professors Crum Brown and Fraser were able to demonstrate the connection between chemical constitution and physiological action. With the help of the advanced chemistry of modern times, an attempt to establish rational therapeutics was being made by the leading pharmacologists of the world. Thus the employment of inorganic salts and chemical principles obtained from the vegetable kingdom, which had been much in vogue about half a century ago, was being gradually abandoned in favor of derivatives obtained from coal-tar and various alcohols. As was once pointed out by the authors of the *Extra Pharmacopœia*, “the place in medical treatment, of quinine and morphine, the two mainstays of the medical practitioners of twenty years ago, is in a great measure filled by antipyrin, antifebrin, phenacetin, exalgine, and salicylate of sodium on the one hand, and by sulphonal, tetronal, chloral, &c., on the other.”† The day was eagerly looked forward to when the articles of our organic *materia medica* were to be supplanted by the creations of the chemist.

Analogy however is no safe guide in science. So Brunton's comparison of the different articles of *Materia Medica* to the weapons of the different geologic periods, is, to say the least, very fallacious. There is something like what may be called “Fashion in medicine.” It is due to this “fashion,” that some of the good old remedies are labelled “out of fashion.” For long it was not considered fashionable to use crude herbs. Synthetic remedies were the fashion of the day. It is not only the great war which is now raging in Europe that has made the pendulum of fashion swing from one extreme to the other, but the oscillation was visible even a considerable time before the outbreak of the War.

* *The British Medical Journal* for August 14th, 1886, p. 326.

† *Extra Pharmacopœia* by Martindale and Westcott. Preface to the sixth edition, p. III.

Thus a reaction seemed to have set in, in favor of plants being used as medicines. Referring to the use of the Bilberry (*Vaccinium Myrtillus*) as a remedy in Typhoid fever and other infectious diseases of the intestine—a paper read by Dr. Max M. Bernstem, M.B., before the Hunterian Society of London and published in the *British Medical Journal* for 7th February, 1903, —Sir James Sawyer, M. D., London, F.R.C.P., Senior Consulting Physician to the Queen's Hospital; and Ex-Professor of Medicine in the Queen's College, Birmingham, wrote in the *British Medical Journal* for February, 4 28th, 1903:—"Long have some of us dwelt with affection, and with hope of finding modern uses for some old drugs which were being lost to sight and to memory in the limbus of the past, and perhaps not without some practical success, upon the archæology of our Medicinal "Simples," upon the histories and lore, upon the forms, virtues, and renown of many old-time Medicinal plants, upon plants called simples because each of them has been held to enshrine its particular curative virtue, and so to furnish a simple remedy for some symptom of disease, or for some individual morbid manifestation. Perhaps we have loved to walk, as Evelyn did, "into a large garden, esteemed for its furniture one of the fairest, especially for simples;" or perhaps we have followed our own Garth, "when simpling on the flowery hills he strayed."

* * *

"True is it to-day as when Sir Thomas Watson so declared a third of a century ago that 'the greatest gap in the science of Medicine is to be found in its final and supreme stage—the stage of therapeutics.' Therapeutics advances by our increasing knowledge of the nature of morbid processes and of the physiological effects of remedies, and also by studying again many a good old drug by the light of later scientific methods and also by judicious selection from the traditions of popular medicine. Such selection gave us Digitalis."

Dr. Ischirch, Professor of Practical Chemistry in the University of Berne, is reported in the *Lancet* of 2nd October, 1909, to have said:—

"We may assuredly hope that medicine, when it has thoroughly ruined its digestion with synthetical remedies and

tested all the organs of the animal body, will return to the most ancient remedies of mankind, to the medicinal plants and drugs, for the utility of which the experience of the thousands of years vouches."

There were other medical men also who were coming to look upon drugs of synthetical origin acting upon the system as foreign bodies, depressing and paralysing its functions. But according to them such was not the case with the drugs of vegetable origin which in their natural combination meet nutritional conditions of the system. The possibilities and potentialities of medicinal plants and vegetable drugs have not been as yet properly and fully studied. In an article on "the teaching of chemical medicine," in the *British Medical Journal* of 3rd January, 1914, Dr. Mackenzie wrote that:—

"Not one single drug has been carefully studied so as to understand its full effects on the human system, effects that could be easily recognised had a systematic examination been carried out when it was administered in the hospital wards."

The above observation of Dr. Mackenzie is fully borne out by what Dr. Charles J. Macalister, M.D., F.R.C.P. has discovered, as reported in the *British Medical Journal* of January 6, 1912, in *Symphytum officinale*, a plant known as "comfrey" in England. He considers it as a "potent cell proliferant." It was a long forgotten remedy which was used in olden times to heal ulcers. On analysis, the root of the plant was found to contain allantione to which Dr. Macalister attributed its action as a potent cell proliferant.

Dr. William Bramwell, M.A., M.D., B. Ch., of Liverpool, concluded a note on the above-named plant published in the same issue of the *British Medical Journal* in the following significant words.

"It is indeed refreshing and gratifying, in these days of serums and vaccines and highly complicated preparations, the administration of which, in some cases, is fraught with the gravest possible danger and soul-harrowing anxiety on the part of the administrator, to find a physician of Dr. Macalister's standing setting on foot the investigation of so simple and natural a remedy as common comfrey."

The present war has shown the necessity of using herbs and plants in preference to Synthetics. The President of the Botanical section of the British Association held at New Castle in 1916, very truly observed, regarding the medicinal plant industry, "Experience would indicate that here is opportunity for investigation, and, unless due care is taken, also danger of waste of time, money and effort. A careful systematic study of species, varieties and races is in some cases desirable in order to ensure the growth of the most productive or valuable plant; and such a study might also reveal useful substitutes or additions. Here the co-operation between the scientific worker and the commercial man is imperative."

The study of medicinal plants is neglected by medical men all over the world, but more so in India. These are contemptuously referred to as "old women's" remedies.* It is our misfortune that the chemistry and pharmacology of most of these plants have not been properly investigated.

The late Right Hon'ble Mr. Gladstone was a man of extraordinary genius. As a scholar, politician, and statesman he will ever shine in the pages of English history as long as England is not effaced from the map of the World. In the course of a speech, delivered on the 26th March, 1890, on the occasion of the opening of Guy's Hospital Residential College, referring to the importance of the study of Botany with a view to learn the "qualities of plants which are so remarkable and powerful in their healing capacities," he said :—

"I am not aware whether Botany now forms a recognised branch of the medical education, but I cannot help wishing that it did, and hoping that it may in the future, first of all, not only because it is in itself a most beautiful

*Dr. John Foote, Associate Professor of Materia Medica and Therapeutics, Georgetown University, Washington, writes of the importance of Trees in Medicine as follows :—

"And yet, in spite of the pharmaceutical image breakers and the therapeutic nihilists, some of the most valuable remedies used in medicine come from trees. * * *

"And if, as has been asserted, the decadence of Rome was really due to malaria, and if her glory was obscured by a cloud of mosquitoes rather than by the dust of battles, then it may be that the possession of some cinchona and the planting of the eucalyptus in the Roman marshes might have prevented a great civilization from withering and fluttering away and changed the countenance of history." [Scientific American Supplement, January 13, 1917 p. 26].

and interesting study exercising the mind without fatiguing it, and stimulating the imagination without leading it astray, but also, because I cannot help wishing, although I know it is too much to expect of our actual medical men, that they should be careful observers of nature, yet in their younger years, before they have entered on their great career, I cannot help wishing that they had the habit of noticing all the qualities of plants which are so remarkable and powerful in their healing capacities." Then Mr. Gladstone narrated an anecdote, how the leaves of a plant healed the cut on his finger caused by an axe in wood-cutting.

"You will think it ludicrous, if I were to tell you a little anecdote of my own, which is of the very simplest character, and it is so small and so slight as almost to be contemptible, but still it illustrates what I mean. I have been given, as is pretty well-known, or at least, I have been given to the pursuit of wood-cutting. From a pure accident, I drew my fingers the other day along the edge of the axe which was lying close by, and which was tolerably sharp, and cut my finger. Upon searching about me I found I had no handkerchief available. I wanted to staunch my little wound. Not having a handkerchief, I got a leaf and put it on the wound. I am bound to say that this was not the result of botanical knowledge, but it was a purely empirical proceeding on the chance of the quality of the leaf. But there was a curious result. I knew the time nature occupied in healing a little breach of continuity, and when I put on the leaf, I assure you it is the fact, that it healed in exactly half the time. It is hardly worth mentioning such a thing as I say but I cannot help having the belief that there are good treasures in nature more than have heretofore been explored in every branch. To make medical students, before they have come to their great responsibilities, observers of the great qualities and capabilities of plants, I cannot help thinking that some good will be done."*

The importance of studying the subject of Indian medicinal plants has been again and again insisted on by several writers. It is too late in the day to discuss the necessity of such a study. The ease and cheapness with which these are procurable, the marvellous powers that are attributed to them in the cure of different maladies by natives of India, should induce us to investigate their properties and settle once for all their claims on our attention.

Dr. John Lindley was a renowned botanist. His views on the subject of vegetable drugs deserve careful consideration. In the preface to his work on *Flora Medica*, he wrote:—

"No one will be bold enough to assert that the physicians already possess the most powerful agents produced by the vegetable kingdom; for every year is bringing some new plants into notice for its energy, while others are

* Guy's Hospital Gazette for 29th March 1890, p. 72.

excluded because of their inertness. In tropical countries, where a fervid sun, a humid air, and a teeming soil give extraordinary energy to vegetable life, the natives of those regions often recognise the existence of potent herbs unknown to the European practitioner. No doubt such virtues are often as fabulous and imaginary as those of indigenous plants long since rejected by the sagacity of European practice. But we are not altogether to despise the experience of nations less advanced in knowledge than ourselves, or to suppose, because they may ascribe imaginary virtues to some of their officinal substances, as has been abundantly done by ourselves in former days, that therefore the remedial properties of the plants are not worthy of serious investigation or that their medical knowledge is beneath our notice because they are unacquainted with the terms of modern science. It is not much above 20 years since an English officer in India was cured of gonorrhoea by his native servant, after the skill of regular European practitioners had been exhausted. The remedy employed was Cubebs, the importance of which was previously unknown, and the rationale of whose action is to this day beyond the discovery of physiologists. It is of undoubted value in urethral catarrh: and who shall say that there are not hundreds of equally powerful remedies still remaining to be discovered. * * * and it must be sufficiently apparent to all unprejudiced minds, that the resources of the vegetable kingdom, far from being exhausted, have hardly yet been called into existence. It is presumptuous for the theorist to assert that he already possesses a remedy for all the maladies that flesh is heir to; it is mere idleness in the routine practitioner, carried away by the attraction of spacious generalities, to fancy that one tonic is as good as another tonic, or one purgative as another purgative. In reality the true cause of the different actions of medicines upon the human body is admitted by the highest authorities to be wholly unknown; and surely this is in itself the best of all reasons why we should not assume that we already possess against disease all the remedies which nature affords; on the contrary it should stimulate us to reiterated enquiries into the peculiar action of new remedial agents. * *

* "And they (i.e., European practitioners) find the medicines which are powerful in Europe, comparatively inactive in other climates. The heat of a country, its humidity, particular localities, food, and the social habits of a people will predispose them to varieties of disease for which the drugs of Europe offer no sufficient remedy, and will render that which is relied upon in one country unworthy of dependence in another. Thus the Cinchona bark of Peru, important as it is in Europe, is, we are told, rejected by the people among whom it grows, because it is found too stimulating and heating for their excitable constitutions. And speaking of Ipecacuanha, Dr. Von Maritus, who so carefully examined practically the *Materia Medica* of Brazil, asserts "*nullum est dubium quin Emetica in terris zonne fervidae subjects effectus producent multo magis salutare quam in regionibus frigidioribus.*"

"This last observation seems to indicate, that if emetic plants are so much more common in hot than cold countries, it is because there is so much greater a necessity for them. The late Mr. Burnett, and many other persons, have asserted that every country spontaneously furnishes remedies for those maladies which the people of the soil are naturally subject to, and that the

foreign drugs imported into the markets of Europe would soon be superseded to a great extent, if the properties of European plants were carefully examined. It is contended, in illustration of this opinion, that Salicine, obtained from our native Willows is equal in energy to Quinine, and that it is formed by Providence in low marshy places exactly where remittent and intermittent fevers are experienced most frequently, and with the greatest severity * * * *

"Such a subject of investigation is by no means unimportant when it is considered * * * that exotic drugs are not only costly, but often so much adulterated as to be unfit for use * * * *

"It by no means follows that plants are inert because medical men have reported unfavourably of their action. The most powerful species have had their energy destroyed by unskilful preparation, or by not knowing at what season to collect them. * * * *

the very nature of the climate of tropical countries generally causes the properties of plants to be more concentrated and completely elaborated than in Northern latitude."

II.

So far the indigenous drugs have not been carefully and systematically studied. The Executive Committee of the Calcutta International Exhibition for 1883-84, reported that "it must be admitted that our ignorance of the properties and uses of indigenous drugs is scarcely pardonable. It seems highly desirable that the whole subject should be gone into with greater care than has yet been done, both with the view of weeding out the worthless from the good, and of preparing the way for a number of the better class native drugs taking the place of some of the more expensive and imported medicines of Europe. It seems remarkable that so large an amount of aconite should be collected in Nepal and exported to Europe, in order to be re-imported into India before it can find its way to the poor people who crowd around our dispensaries. Illustrations of a similar nature can be multiplied indefinitely. *Atropa Belladonna*, the deadly nightshade, for example, is a common weed on the Himalayas from Simla to Kashmir, yet every ounce of the drug used in India is imported from Europe, the Indian plant having apparently been entirely overlooked."*

* Official Report of the Calcutta International Exhibition, 1883-84, Vol. I, pp. 316-317.

But for the proper study of the subject, a work exclusively devoted to Indian medicinal plants has been a great desideratum in the medical literature of India. Messrs. Hooker and Thompson writing as far back as 1855, said:—

“We have had a considerable experience both in medical and economic botany, and we announce boldly our conviction that so far as India is concerned these departments are at a standstill for want of an accurate scientific guide to the flora of that country.”*

The flora of British India commenced by Sir Joseph Hooker in 1872 is now completed. The great value of this work as a scientific guide to the plants of this country can hardly be doubted. The foundation of a medical botany of India should be grounded on this work. In this medical botany should be included all the plants that are used medicinally by the natives of this country. A very large number, perhaps the vast majority of these plants, will be found perfectly useless, but in the present state of our knowledge we are not justified in excluding any from the list. The great aim of this work being to collect and identify the medicinal plants of the country, it should, after giving the plants its modern scientific name, insert the synonyms under which it was known in former times.

The value of Sanskrit and vernacular names of plants has been much questioned by botanists for purposes of identification. But, I think, these synonyms help a great deal towards identification. †

* Introductory Essay to the Flora Indica, p. 3, London, 1855.

† The importance of Sanskrit names of plants was fully understood by Sir William Jones, the President Founder of the Asiatic Society of Bengal. More than a century ago he suggested that “the first step in compiling a treatise on the plants of India should be to write their true names in Roman letters, according to the most accurate orthography, and in Sanskrit preferably to any vulgar dialect; because a learned language is fixed in books, while popular idioms are in constant fluctuation, and will not perhaps be understood a century hence by the inhabitants of these Indian territories, whom future botanists may consult on the common appellations of trees and flowers.” (Sir Wm. Jones’ Works, Vol. II, London, 1799, p. 2.)

On another occasion Sir Wm. Jones said:—

“I am very solicitous to give Indian plants their true Indian appellation; because I am fully persuaded, that Linnaeus himself would have adopted them, had he known the learned and ancient language of this country. * * * Far am I from doubting the great importance of perfect botanical descriptions; for languages expire as nations decay, and the true sense of many appellatives in every dead language must be lost in the course of ages; but as long as those

Much trouble will be saved to the experimenting physician by the help of the country names of plants. Modern India

appellatives remain understood, a travelling physician who should wish to procure an Arabian or Indian plant, and without asking for it by its learned or vulgar name, should hunt for it in the woods by its botanical character, would resemble a geographer, who, desiring to inquire by name for a street or a town, but waits with his tables and instruments for a proper occasion to determine its longitude and latitude" ("Botanical Observations on select Indian Plants." Sir Wm. Jones' Works, Vol. II P. 47, London, 1799.)

In Sanskrit every plant bears several synonyms which may facilitate in tracing the history and identification of the plant.

"Every single word in Sanskrit," writes Professor Sir Monier Williams, "is referred to *dhatu* or root which is also a name for any constituent elementary substance, whether of rocks or living organisms. In short, when we follow out their grammatical system in all the details of its curious subtleties and technicalities, we seem to be engaged, like a geologist, in splitting solid substances, or like a chemist, in some elaborate process of analysis." (Preface to Sanskrit Dictionary p. vi.)

These Sanskrit synonyms to be of any use, should be accompanied with a literal translation into English.

Mr. C. B. Clarke does not think that the vernacular names of plants help much in identifying them. For he says :

"I have observed that the eagerness to get native or vulgar names for plants is directly proportioned to the ignorance of the enquirer, those who know nothing about the plants and who are unable to discriminate them under any names being always loud in their call for native or local names."

Again, "as to the grand Sanskrit names, they are of still less value than the vulgar ones, being founded on less actual observation, with the object of enriching the language." (Preface by Mr. Clarke to his Edition of Roxburgh's *Flora Indica*, p. ii, Calcutta, 1874.)

I think these remarks of Mr. Clarke are not quite justifiable, and they are not shared in by other eminent botanists. For instance, Sir David Brandis, who has been called the "Father of Indian Forestry," says regarding the vernacular names of plants, :—

"The critical examination of the vernacular names of the different Indian languages, and their derivation from the Sanskrit or other roots, will be found a most interesting and important study. * * * The forester should not despise vernacular names, for in many instances they have a fixity which systematic names do not yet possess. We all know the ever green *Khirmi*, and there can be no mistake about it; but botanists are not yet agreed whether the tree shall be called *Mimusops indica*, *hexandra* or *Kauki*. *Kamela* or *Kamila* is a well-known small tree, its systematic name among Indian botanists, however, which for more than half a century was *Rottleria tinctoria* has now and properly been changed into *Mallotus philippinensis*. Again, there can be no doubt as to the tree designated by *kao*, *kan*. Although some botanists call it *olea europea*, others *olea cuspidata*, and others *olea ferruginea*. * * * These changes of systematic names are not arbitrary—as a rule, they are dictated by the progress of scientific research; but they are apt to discourage the student, and on that account, also, vernacular names merit attention." (Forest Flora of N. W. India, Preface : pp. xi and xii, London, 1874.)

When the Pharmacopœia of India was issued, it was considered a great defect in the work that it had not given the vernacular names of the plants. In reviewing the work, a writer said :—

"Many of the non-official remedies, the introduction of which to regular practice is avowedly one of the objects of the publication of this Pharmacopœia, are dismissed without a single vernacular name for them being given. The recommendation, for example, of the committee, that *Hymenodictyon*

abounds with professional herbalists. There are the Musheras in Central and Upper India, whose principal livelihood consists in the collection and sale of medicinal roots and herbs.*

In Bengal there are the Mâlis, Bâgdis, Kaibartas, Pods, Chandals, Kaoras and Karangas, who principally carry on the trade in jungle products.† In Bombay, the Chadras, Bhils, and Gamtas are the herbalists. Now, these communities can prove of immense service to our medical practitioners in supplying medicinal plants. But as they are not trained in any university so as to be able to understand the Latin or scientific names of plants, the only way to secure their services lies with the medical practitioners in mastering the native names of plants. A great deal of time and trouble will be saved by thus giving the vernacular names of plants the importance they deserve.

It is, however, proper to add that too much confidence can not be placed in the vernacular nomenclature. In India, in the same district, one and the same name is applied to two or more different plants. And in some instances, names without any

excelsum should be looked to as likely to prove a valuable specific for malarious fevers, is pretty certain to be quite thrown away on a medical officer, who is not an expert in botany, for not a single native name for this tree is given either in the book itself or in the index; and though it might happen to grow in forests round his station, the committee put him in possession of no means of recognising it. * * * This very grave defect in the Pharmacopœia, cannot be removed by the publication of a separate catalogue of native names, as proposed. In a second edition we hope to see not only a full vernacular index, but to find, following the botanical name of each substance, as complete a list as possible of the vernacular synonyms for it which are current in the three presidencies." (Calcutta Review for 1869, p. 201.)

All the above extracts will show that the importance of vernacular names of plants is fully recognised by those whose opinion is entitled to respect on this subject.

* An excellent account of this tribe is given by Mr. J. C. Nesfield, M. A., Inspector of Oudh Division, Lucknow, in the Calcutta Review for January, 1888. Mr. Nesfield writes:—"Indian physicians (Vaidya) and Indian druggists (Pansari) are almost dependent as far as medicines are concerned, on what Musheras supply to them. * * It is much to the credit of Musheras that they have given a marked preference to the study of nature, and opened the door to the discovering of natural remedies. In fact, their knowledge of medicine is one of the chief characteristics of this tribe. * * They collect medicinal herbs for sale and receive grain or money for what they supply. * * I know of no parallel to such knowledge as that possessed by Musheras within India itself." (Calcutta Review, pp. 40-41, for January, 1888.)

† Hunter's Statistical Account of Bengal, Vol. I, p. 27.

significance are invented by villagers to satisfy the curiosity of enquiring botanists. These names are of no use. Such being the case, a knowledge of botany to critically examine a plant is absolutely necessary.

Besides botanical description and vernacular nomenclature, illustrations of plants prove a great help in identifying them. Though illustrations of several thousands of Indian plants are scattered in the works of Rheede, Roxburgh, Royle, Wight, Wallich, Beddome, Brandis, and Griffith and in the journals of the Linnæan and other learned societies, yet a very large number of medicinal plants of this country remains to be illustrated.* The sooner illustrations of these plants are made the better for the cause of the study of indigenous drugs.

After proper means have been taken to identify the medicinal plants, so that we are quite sure that we all mean the same thing by the same name, we should turn our attention to the study of their properties and uses. We may commence such study with advantage, and it will be, moreover, of historical importance, if we first of all take into consideration the uses to which these plants were put in ancient times by the Hindus. With this view, we should consult the medical works of the Hindus, *e. g.*, Charaka, Sushruta, Nighantu, &c.

Nor should we despise the experience and observation of the Greco-Arabic School of practitioners regarding the uses of the indigenous drugs. Thus the Taleef Sheriff (which has been translated into English), is an excellent work on therapeutics, and gives within a narrow compass the uses of some of the most important medicinal plants of this country.

We should also take into consideration those drugs which are in much use amongst rustics and villagers, and of which no account is to be met with in the works of either the Hindu or Greco-Arabic school of practitioners. It is a pity that no attempt has yet been made to collect information from the villagers regarding the medicinal virtues of plants that grow around

* Most of the above mentioned works, however, are out of print, and being rare, are hardly within the reach of the most of the members of medical profession.

them and the uses to which they are put. * If we turn to the past history of our art, we find that our knowledge regarding the properties of some of the most useful medicines has been obtained in this empirical way.

Lastly, we should not neglect to bestow our attention on those indigenous plants which have not been used medicinally by the natives of this country, but are in much use in other countries.

After recording the medicinal uses, we have to commence the more important subject, *viz.*, that of "weeding out the worthless from the good" amongst these medicinal plants. For this purpose, we have to seek the aid of chemistry. It is well-known that plants generally owe their virtues as medicinal agents to certain characteristic alkaloids and principles present in them. Because a complete and full chemical analysis of the medicinal plants of this country has not yet been performed, it is therefore that there exists so much uncertainty regarding their actions. This isolation of principles will constitute a great improvement in pharmacy. For, then, instead of using preparations made from plants which differ in constitution from time to time, and vary in the strength of their active principles and physiological characteristics, depending on the climate, season, and amount of sunshine under which, and the soil in which, they have grown, we should use the active principles in which the same variability is unlikely to occur. Moreover, they would possess the advantages of being always alike, easily assimilable and capable of ready solubility, ease in administration and rapidity as well as certainty of action. Then a practitioner also could carry his whole dispensary in a portable form.†

This chemical analysis would also help us in determining the actions of medicines in health and disease. It should, however, be borne in mind, that chemical analysis but imperfectly reveals the real nature of many drugs. The presence of dissociated

* *Vanauśadi Prakāś*, by Mr. Vasudev Chintaman Bapat, in Mahrathi, is as far as I know, the only work which gives the uses to which some of the medicinal plants are put by the natives of Concan.

† The alkaloids have all been discovered within the last 100 years. For want of chemical investigation indigenous drugs are used in their crude forms, instead of their alkaloids or active principles. Brunton's "Iron Age of Therapeutics," is one of remote and uncertain future, but I believe a great deal of iron, if not steel, can be extracted, very useful for all practical purposes from the stones in the shape of our indigenous drugs.

ions, of colloidal metals, with an action analogous to that of ferments, and of known and unknown physical properties, such as radio-activity, probably enter into the action of many drugs. All the phenomena of plant life are not explicable in terms of chemistry and physics; there are certain residual phenomena which point to the existence of what may be called in the present state of our knowledge, "vital force."*

It is hence, that many medical practitioners have been disappointed with tinctures and other preparations of medicinal plants, because such preparations did not give any satisfactory results when prescribed to patients. Speaking of *Oolut-Kumbal*, (*Abroma augusta*) Dr. Bhoobun Mohun Sirkar wrote in the Indian Medical Gazette for May, 1900 :—

"Attempts have been made to administer the drug in the more acceptable forms of tincture, pill or powder, but none prove so efficacious as the fresh viscid sap in substance in which form I have used it with wonderful results."

It is well-known that the people of India use the juice of fresh vegetables for medicinal purposes. But on chemical analysis, these vegetables do not yield any peculiar chemical substances to which their curative virtues could be justly attributed. It has been the tendency of late, therefore, to disapprove the use of such vegetable remedies. A well-known medical man writes in Allbutt's System of Medicine :—

"The chemical composition of a drug is not unfrequently the key to its pharmacological action.....If a drug have no active properties, it is surely devoid of medicinal effect unless it be a food; for medicinal action is the outcome of the effects of active principles on tissues. It is always possible that in any particular drug the active medicinal agent may have escaped notice; but in the present state of chemical science it is not likely that undiscovered principles reside in such substances as sarsaparilla and hemidesmus: yet these drugs are given on

*Biochemistry of plants and animals has not yet been fully investigated. We do not know even much about the function of enzymes, regarding which two views are held one that they are a property and the other that they are a substance. Chemistry cannot produce them. They are found only as the products of protoplasm of living cells. It may be that many processes taking place in living cells are the results of Enzyme activity.

the testimony of experience,—a testimony no stronger than that which has supported scores of other agents eventually discarded. If the indications, given by the pharmacological examination of a drug, are opposed to experience in its favour, the latter must almost certainly be at fault.”*

But clinical experiences and observations of eminent physicians on the actions of a drug are as much entitled to respect and consideration as its pharmacological examination. So the view of the writer quoted above does not seem to us to be sound.

The modern method of therapeutical investigation is, first, to observe the action of a drug on a healthy animal, and then to make the results applicable to pathological states. The ancients recognised only one mode of studying the effects of a remedy, and that was by the simple observation of effects produced by drugs when administered in disease. This clinical observation of the action of remedies has been productive of some good, but it is questionable if much progress was effected so long as this method alone was employed. Towards the beginning of the nineteenth century, the necessity for ascertaining the actions of remedies by experiments on animals, was recognised by Bichat, Majendie, and others. This modern method of therapeutical research promises a great success. Working on this line, Lauder Brunton was able to use with success nitrite of amyl in angina pectoris. Here a correct application of a known action in a drug was made serviceable in the very first trial. The pharmacological experiments and clinical observations will thus settle the claims of Indian drugs on our attention.

III.

The Vedic Aryans were acquainted with about a hundred medicinal plants. When a king appoints a Purohita, he repeats a prayer in which he entreats that all the herbs of a hundred kinds over which King Soma rules will grant him uninterrupted happiness.

From the works of Charaka and Sushruta we learn that the Indo-Aryans were acquainted with a large number of medicinal

* Dr. D. J. Leech in Vol. I of Allbutt's System of Medicine, London, 1896.

plants. In Sushruta are recorded the properties and uses of some 700 of them ; but all of these were not indigenous to India. Some foreign drugs were imported into this country. In ancient times there was a trade in drugs between the Hindoos and other nations. Liquorice, which does not grow in this country, was extensively used in Hindoo Medicine. It grows in Asia Minor and Central Asia, and was brought to this country by the nomadic tribes of Central Asia. We find mention of it in Charaka and Sushruta. The majority, however, of the medicinal plants in these works were indigenous to this country. Their properties were known by empirical means. Information regarding them was gathered from hunters and shepherds. For this purpose, physicians were enjoined to penetrate forests and climb mountains.

The works of Charaka and Sushruta appear to have been composed in the pre-Buddhist period. The rise of Buddhism gave an impetus to the study of medicine in ancient India. The edicts of Asoka provided the establishment of hospitals at all principal towns and cities of India for the sick and the wounded. The Buddhist missionaries penetrating the dreary wilderness of Siberia and Central Asia preaching the tenets of benevolence and humanity to the savage tribes, also attended to treating the sick and the wounded. They were in one sense medical missionaries. The teachings of the Hindoo system of medicine were also spread to the countries which adopted Buddhism. The Buddhist missionaries brought with them drugs of other nations to India, and thus enriched the *materia medica* of Hindoo physicians.

The Greek invasion was not without influence on the medical practice of ancient India. The *savants* who accompanied the army of Alexander learnt much of the metaphysical, philosophical, and medical systems from the Hindoos. The successors of Alexander brought Greece and India into closer contact. Commerce was established between the two countries. It was thus that a large number of drugs of Central Asia and Asia Minor found their way to India. Greek physicians also came to know several medicinal plants of this country. As the Greeks

learnt much of the healing art from the Hindoos, so the latter were indebted for their knowledge concerning several foreign drugs to the Greeks.

The rise of Muhammadanism brought about a new era in the history of civilization. The Arabs paid great attention to the cultivation of science and art. Although they did not discover or invent anything new, yet they preserved most of the known sciences of the ancient world. Without them, it is doubtful if the modern world would have been in possession of the philosophical and scientific lore of the Greeks or the Hindoos. Hindoo physicians adorned the court of the rulers of Bagdad. Medical works of the Hindoos such as Charaka, Sushruta, Nidâna, &c., were translated into Arabic. The teachings of Hippocrates, Democritus, and other Greek physicians were made known to the world by the countrymen of Muhammad. When India came to be under the Islamic power, Muhammadan physicians known as Yunani Hakims were patronized by the court. They were versed in the medical lore of the Greeks. They brought with them the teachings and doctrines of the Greek masters of the healing art, and also made known the properties and uses of several drugs of Central Asia. The Hindoo system of medicine, on the rise of the Muhammadan power, came to a stand-still; but the Hindoos were not slow in making use of those drugs which their Muhammadan conquerors had made known to them. Of all the drugs perhaps the most important one imported into India by the Muhammadans was opium. Before the Muhammadan supremacy in India, there is hardly any mention of opium to be met with in Hindoo works of *Materia Medica*. The principal works of Hindoo *Materia Medica* composed during the Muhammadan period of Indian history are :—

(1) *Râja Nighantû*, by Narahari Paṇḍita. Regarding this work, Professor H. H. Wilson writes that “from the frequent occurrence of the Dakhini terms in explanation of his Sanskrit text it is inferred that he was an inhabitant of the south of India.” The date of composition of this work has been fixed by the same authority at some time between the 12th and 13th centuries. (*Vide* H. H. Wilson's Works, Vol. V., p. 237.)

(2) *Madana Pāla Nighaṇṭu*, by Madana Pāla, a king of Kanauj. The late Raja Rājendra Lāla Mitra placed the date of composition of this work somewhere in the twelfth century (*vide* R. L. Mitra's Notices of Sanskrit MSS. II, p. 264).

(3) *Bhāva Prakāśa*, by Bhāva Miśra. It treats of Anatomy, Physiology, Medicine, Surgery, Materia Medica, and Therapeutics. Its date has been fixed at about the sixteenth century.* This work gives a very concise and clear account of all the medicinal plants and animal and mineral substances used medicinally by Hindoo physicians.

Yunāni Hakims, that is the Muhammadan physicians of India, also have written a great deal concerning the indigenous drugs of this country. The encouragement accorded to Muhammadan physicians by their rulers led them to produce many meritorious works on medicine. Under the patronage of the court of Dehli, the Yunāni Hakims vied with one another in paying attention to the study of indigenous drugs. Their works are however not of any antiquity. The *Taleef Sheriff* is a monograph, clearly setting forth the views of Yunāni Hakims on indigenous drugs. The *Makhzan-ul-Adwiyā*, which has been made much use of by Dr. Dymock in his Vegetable Materia Medica of Western India, is also another important work on the subject. There are several other works by Muhammadan physicians, some in Persian, and others in Urdu, treating of indigenous drugs.

It is during the Christian period of Indian history, that our knowledge regarding indigenous drugs has been much increased by the investigations and labors of botanists and physicians. The three myrobalans of the East were eagerly sought after by the early Portuguese discoverers of the sea-route to India. Indian spices were also made known to Europe by them. Informations concerning the drugs of this country are scattered in the works of European travellers and navigators to this country during the sixteenth and seventeenth centuries.† At the same time several

* The late Dr. U. C. Dutt has given strong reasons for the work being a production of the sixteenth century, see introduction to his *Materia Medica of the Hindoos*.

† A very important work was that of Garcia D'orta, named *Colloquios dos simples e drogas da India*. This has been lately translated into English.

foreign medicinal plants, especially of America, were brought to and naturalized in India by the Portuguese, Dutch, and other maritime nations. *Agave Americana*, *Ananasa sativa*, *Anona squamosa*, and several other native plants of America are now to be met with throughout the peninsula of Hindustan. Von Rheedee tried to gather all the informations about the medicinal uses of the plants of this country in his *Hortus Malabarica*, which should be looked upon as the first systematic work by a European, giving the medicinal uses of the plants of India. But little attention was paid to the medicinal plants of this country till the foundation of the Asiatic Society of Bengal. The Society was established mainly through the exertions of Sir Willam Jones, who was its first president. He was as great a botanist as a classical scholar. He looked upon the Society as corresponding in its aims and objects to the Royal Society of England. The Asiatic Society has fulfilled the expectations of its gifted founder. Sir William Jones himself pointed out the importance and necessity of studying the Indian medicinal plants. In a paper on the design of a treatise on the plants of India, read by him before the Bengal Asiatic Society, he said that "Some hundreds of plants which are yet imperfectly known to European botanists and with the virtues of which they are wholly unacquainted, grow wild on the plains and in the forests of India. The *Amarakosha*, an excellent vocabulary of the Sanskrit language, contains in one chapter the names of about 300 medicinal vegetables; the *Medini* may comprise many more; and the *Dravyâbhidhâna* or Dictionary of natural productions includes, I believe, a far greater number, the properties of which are distinctly related in medical tracts of approved authority."^{*}

The example set by Sir William Jones was not lost upon his successors. Roxburgh, the Linnaeus of Indian Botany, collected all the informations about the medicinal plants of this country in his *Flora Indica*. Professor Lindley in his work on *Flora Medica* is indebted for his information regarding the medicinal plants of India to Roxburgh's *magnum opus*. Roxburgh's *Flora Indica* was an authority on the medicinal plants of this

* Sir Wm. Jones' Works, London, 1799, vol. II, p. 2.

country till the publication of the Pharmacopœia of India. Mr. Clarke in his edition of Roxburgh's *Flora Indica* writing in 1874, truly observed that "Roxburgh contains all the Economic Indian Botany known to him, and we have added very few economic facts since. * * * We have had plenty of Government and other reports, some very large and expensive ones it is true, but we have very little economic work by persons competent as botanists. * * * Roxburgh is most trustworthy in his Economic botany, and contains virtually all that is known on the subject."*

In the beginning of the nineteenth century, John Flemming contributed a valuable paper on the medicinal plants of this country. It was a monograph of no inconsiderable value and was published in the *Asiatic Researches*, Vol. XI, for 1810 under the title "A Catalogue of Indian Medicinal Plants and Drugs with their names in Hindustani and Sanskrit." For the first time, the scattered information on the subject was collected and placed before the medical profession.

The most important work, a work which is referred to by all writers on indigenous drugs composed during the early part of the last century, was the *Materia Indica* of Ainslie. He spent the period of his Indian exile in Madras, and has given a very satisfactory account of the drugs in common use in that Presidency.

The formation of the Medico-physical Society of Calcutta, contributed not a little to the study of indigenous drugs. In the Transactions of that Society were described for the first time some of the vegetable drugs of this country. Wallich, Horace Hayman Wilson, Dewan Ram Comal Sen, and several others brought to the notice of the profession many native remedies.

The labors of Dr. J. F. Royle deserve special mention; for he paid especial attention to the economical plants of this country. The Botanical Gardens of Saharanpore owe a great deal to his labors. In his works on the Antiquity of Hindoo Medicine, *Materia Medica*, and Botany of the Himalayan mountains,

* Clarke's edition of Roxburgh's *Flora Indica*, Calcutta, 1874, Preface, p. iii.

he brought to the notice of the medical profession several medicinal plants in common use amongst the inhabitants of India. The advantages which Saharanpore possesses for the naturalization of plants of the colder regions induced him to try and cultivate the medicinal plants of other countries. He also contributed an excellent paper on the Bazar medicines to the Journal of the Bengal Asiatic Society.*

Mention should also be made to the labors of the Agri-Horticultural Society. The Society with its branches in different parts of India has rendered some help to the cause of indigenous drugs, as is evident by the Transactions of the Society.

Sir William O'Shaughnessy, who was the first Director of Telegraphs in India and occupied the chair of Chemistry at the Medical College, Calcutta, spent many years in investigating the subject of indigenous drugs. Several drugs were for the first time chemically analysed by him. Dr. Wallich, who was at that time in charge of the Calcutta Botanical Garden, rendered him much help in identifying the medicinal plants of India. The combined labors of O'Shaughnessy and Wallich have produced the valuable pharmacopœia of Bengal, published under the authority of the Government of Bengal in 1844. No pains were spared by O'Shaughnessy to make use of the labors of his predecessors. The publication of this work gave a fresh stimulus to the study of indigenous drugs. The subject even engaged the attention of chemists and pharmacutists of Europe, and several drugs were admitted as officinal in the pharmacopœias of other countries.

The holding of exhibitions has been the most important means in increasing our knowledge of indigenous drugs. I doubt if the amount of information which we possess at present about indigenous drugs could have been derived from any other source. The idea of exhibitions originated with the late Prince Albert, under whose auspices the first one was held in London in 1851. Dr. Royle was placed in charge of indigenous drugs, but I do not think the first exhibition, which was rather a trial, made

* This paper was published under the title "*Articles of Materia Medica obtained in the Bazars of India*," in the first volume of the Bengal Asiatic Society's Journal.

any material addition to our knowledge of the subject. In the second International Exhibition in London of 1862, Dr. J. F. Watson was placed in charge of the indigenous drugs. For the first time, several indigenous drugs were brought to light.

In the interval between the first exhibition of 1851 and the second one of 1862, several exhibitions were held in different parts of this country. But I do not think they added anything to our knowledge of indigenous drugs.

The publication of the *Pharmacopœia of India* in 1867 under the authority of Her Majesty's Secretary of State for India marked an epoch in the history of the subject. To this day, that stands out as the authoritative work on the native remedies of this country. "With the view, firstly, of bringing to the notice of the profession in India those indigenous drugs which European experience has proved to possess value as medicinal agents, and which may be employed as efficient substitutes for imported articles; and, secondly, of remodelling the *Bengal Pharmacopœia* of 1844, Her Majesty's Secretary of State for India in Council was pleased to sanction the publication of a *Pharmacopœia for India* based upon the *British Pharmacopœia*, which, while affording all the information contained in that work of practical use in India, would embody and combine with it such supplementary matter of special value in that country as should adapt it to meet the requirements of the Indian Medical Department." *

The information that lay scattered among a large number of periodicals was brought together in this work and made accessible for reference to the medical officers serving in this country. Between the publication in Calcutta of the *Bengal Pharmacopœia* in 1844, and the issue of the *Indian Pharmacopœia* in 1868, that is during the period of twenty-four years, great advances were made in our knowledge regarding the medicinal properties and therapeutic uses of the indigenous drugs.

The establishment of Medical Colleges and schools in this country also advanced our knowledge of indigenous drugs. The graduates whom the colleges turned out directed their attention

* Preface to the *Indian Pharmacopœia*, p. vi.

to the subject. They were not slow in recognising the importance of the study of indigenous drugs. There were other laborers also in the field. Dr. Waring, who edited the Indian Pharmacopœia so creditably, was one of the most painstaking and careful observers of the properties and uses of indigenous drugs. His attention was drawn to the subject when serving out in Burma. The stock of his European medicines having been exhausted, he was in great perplexity and hardly knew what to do. In such a crisis, he turned to the medicinal plants of the country. His extensive knowledge of Botany stood him in good stead greatly. He found indigenous drugs to answer his purposes as satisfactorily as the costly imported medicines of Europe. The series of papers under the title, "Notes on some of the principal Indigenous Tonics, Anthelmintics, &c., of India," published in the early volumes of the "Indian Annals of Medical Science," now defunct, shows the careful and painstaking manner in which he had studied the subject.

The use of the Pharmacopœia as a text book in the colleges and schools of this country, has also been productive of some good. The Pharmacopœia Committee was not wrong in imparting an educational character to their publication. The native remedies having been rendered familiar during the period of studentship, have been often made use of by Indian Medical Graduates.

Mention should also be made of the establishment of the Forest Department and the School of Forestry in this country as helping in increasing our knowledge of indigenous drugs. The forest officers have brought to light several plants used medicinally by the natives of this country. The late Dr. Stewart in his Punjab Plants, mentioned a large number of medicinal plants used by the rustics and villagers of the Panjab. Mr. Gamble and other forest officers have also noticed the medicinal plants of other parts of India. The increase in our knowledge of the properties and uses of the indigenous drugs by these means has not been inconsiderable.

The Calcutta International Exhibition of 1883-84 has done much towards the study of indigenous drugs. Credit is due to

Mr. T. N. Mukerjee and Sir George Watt, who spared no pains to make the Exhibition of indigenous drugs as complete as possible. The Dictionary of the Economic Products of India, originally projected by Mr. Mukherji, but subsequently completed by Dr. G. Watt, contains informations from all possible sources, as to the uses and properties of indigenous drugs.

IV.

"The only way to illumine the whole field of native therapeutics," wrote an intelligent foreigner, "is to survey it in small tracts and sift the value of those drugs peculiar to each province. There is a wide feeling that there is a beneficence in the scheme of nature which provides in every country suitable remedies on the spot for the ill to which humanity is locally most prone. Very little has been done so far to incorporate in the practice of physicians in the country the medicines which in India nature scatters broadcast from her lap."

It is necessary to pass in review the principal works which have advanced our knowledge of the subject. In order to do this, we should take into consideration those works which treat of the drugs of the different provinces of this country. In fact, excluding the "*Pharmacopœia of India*," the "*Pharmacographica Indica*" and Watt's "*Dictionary of the Economic Products of India*," all the works which have made their appearance deal with drugs and medicinal plants of certain provinces only. For obvious reasons this arrangement is a good one.*

I have already stated the great stimulus that was given to the study of the subject by the establishment of the Asiatic Society of Bengal. Calcutta as till recently the Capital of India possessing one of the finest Botanical gardens in the world afforded great facilities for the study of the subject. Roxburgh, Fleming and Royle were the first to write about the medicinal plants and their uses in the Asiatic Researches and the Journal of the Bengal Asiatic Society. But there was no systematic treatise on the

* Of the drugs used by the ancient Hindus, the best account in English is the work on Hindu *Materia Medica* by the late Dr. Uday Chand Dutt. This work requires re-editing.

indigenous drugs of Bengal till the publication of O'Shaughnessy's Bengal Dispensatory in 1842. Before the publication of this work, information concerning indigenous drugs was scattered in the journals and transactions of several learned societies, which were not easily accessible to all members of the medical profession. Mr. Louis DaCosta wrote in the Journal of the Bengal Asiatic Society for May, 1837, "it is a desideratum to know how the natives have treated the subject of medicaments—what of good their books contain—what of error. Our medical practice pays, perhaps, too little attention to vegetable remedies, of which the orientals possess an infinite variety, many inert but many active, and many also quite unknown to Europeans." The Bengal Dispensatory supplied a long-felt want on the subject. This was followed in 1844 by the Bengal Pharmacopœia. These two works form important landmarks in the literature of indigenous drugs. They were not free from errors. Even the author acknowledged that his multifarious duties prevented him from bestowing that amount of attention on the subject which its importance demanded. But considering the difficulties he had to contend with, the scanty materials which existed on the literature at his time, I think great credit is due to him for his works. He was one of the pioneers in this field of research. And it should not be forgotten that his Pharmacopœia of Bengal subsequently formed the groundwork of the Pharmacopœia of India.

The next work on the "Indigenous drugs of Bengal" is that of Kanay Lal Dey. That gentleman is a well-known authority on the subject. In 1862, for the International Exhibition held in London, he forwarded indigenous drugs chiefly of Bengal. The catalogue of drugs exhibited by him was subsequently published in book-form at the request of the Inspector-General of Civil Hospitals of Bengal. This work was a decided improvement on O'Shaughnessy's Pharmacopœia and Dispensatory.

No other work on the indigenous drugs of Bengal deserves any notice. Mr. T. N. Mukerji's "Catalogue of Amsterdam Exhibition" is a useful one, but it is principally compiled from the above sources.

There is no work treating of the indigenous drugs of Assam, Orissa, or of Behar (excepting Irvine's short account of the *Materia Medica* of Patna, published in 1848). Notices of some of the medicinal plants and indigenous drugs of Assam and Orissa are to be found in the Gazetteer volumes of those provinces.

There have been a host of medical men to work out the medicinal plants and indigenous drugs of Madras. In the early days of the East India Company, Madras, the so-called benighted Presidency of to-day, attracted more scientific and medical men than any other part of India. It was on the Madras side that most of the illustrated works on Indian Botany were prepared. Rheede's "*Hortus Malabarica*," Roxburgh's "*Coromandel Plants*," Wight's "*Icones*," Beddome's "*Flora Sylvatica*" were all prepared by men who labored in that Presidency. Ainslie's "*Materia Medica of Hindustan*" published in 1813, and "*Materia Indica*" published in 1826, are still works of reference on the indigenous drugs of Madras. Waring was another authority on the Madras indigenous drugs. His labors have been embodied in the *Pharmacopœia* of India.

Bidie's "*Paris Exhibition Catalogue of Raw Products of Southern India*" is a useful publication on the indigenous drugs of Madras. In the *Madras Quarterly and Monthly Journal of Medical Science*, there are several papers from his pen on the subject of indigenous drugs.

Moodeen Sheriff will always occupy a prominent place amongst the workers on the subject of indigenous drugs. His *Supplement to the Pharmacopœia of India* established his reputation as a pharmacist of no mean order. His posthumous work on the "*Materia Medica of Madras*," has brought our information on some of the indigenous drugs of that Presidency up to date. It is unfortunate, however, that this work did not receive the last finishing touch of the author.

The indigenous drugs of Bombay, though neglected for a long time, have recently received proper attention. Dalzell and Gibson's "*Bombay Flora*," published in 1861, paved the way to the better study of the subject. Birdwood's "*Vegetable*

Products of Bombay," published in 1862, was the first work that gave a systematic account of the Bombay drugs. In the *Pharmacopœia of India* published in 1867, the Bombay drugs were not adequately represented. But since then, due principally to the labors of Sakharam Arjun and Dymock, the Bombay drugs have been far better worked out than those of any other part of India. Sakharam Arjun's "Bombay Drugs" was published in 1879. He was a skilled botanist, being the occupant of the Chair of Botany in the Grant Medical College. This publication was intended to serve as a catalogue of the Indian drugs in the Museum of the Royal Victoria Hospital at Netley. Dr. Sakharam Arjun succeeded in correctly identifying some of the bázár drugs and brought to the notice of the profession a good many medicinal plants used by the natives of Bombay.

Dymock's "Vegetable Materia Medica of Western India" is by far the best work on the indigenous drugs, not only of Bombay, but of India generally. It bears strong testimony to his having patiently worked at the subject for a large number of years. The *Pharmacographica Indica* will remain, for many years to come, the standard work of reference on indigenous drugs.

The medicinal plants and drugs of Sind have not yet been properly studied. The only work on the subject is that of Murray on "Plants and Drugs of Sind." Murray, neither being a medical man nor a skilled botanist, compiled his work from other sources and, as such, the work is of doubtful value as a guide to the plants and drugs of that province.

Our knowledge of the medicinal plants and drugs of the Punjab is also scant and meagre. Honnigberger's work named "Thirty-five years in the East" was the first one mentioning the Punjab medicinal plants and drugs. Honnigberger was a homœopathic practitioner and was physician to Ranjit Singh. The work is hardly of any value, and is very seldom referred to now-a-days.

The Punjab Exhibition of 1864 brought for the first time to light the drugs of that province. Mr. Baden Powell described

the raw products in his well-known work on the Punjab products. Dr. Burton Brown, the late Principal of the Lahore Medical College, was the reporter on the drugs of the Punjab. As a chemist and a botanist Dr. Brown was well qualified to properly discharge his duties as a reporter. And up to this date, his report is the sole authentic guide to the drugs of that province.

Dr. Stewart, as Forest Officer, in his work on "Punjab Plants," noticed some of the medicinal plants of that province. He freely acknowledged the great help he derived from Dr. Brown in identifying many medicinal plants. Dr. Stewart's work is very valuable and, together with Dr. Brown's Report above referred to, is the only work mentioning some of the medicinal plants of the Punjab.

Of the medicinal plants and drugs of the United Provinces of Agra and Oudh we know very little. Mr. Atkinson's work on the "Economic Products of the North-West Provinces" is the only work treating of the drugs of those provinces.

The medicinal plants and drugs of the Central Provinces and Rajputana have not been properly worked out. It is highly desirable that these provinces should receive, at the hands of botanists and medical men, that amount of attention which they deserve.

Thus it will be seen that, although there are many works on the medicinal plants and drugs of different provinces of India, yet a great deal remains to be done for the drugs and medicinal plants of Cashmere, Beluchistan, Sind, Punjab, United Provinces of Agra and Oudh, Behar, Orissa, Assam, Central Provinces and Rajputana. Owing to the publication of the *Pharmacographica Indica* and Watt's "Dictionary of the Economic Products of India," there is not the same difficulty now to work out the subject which the early laborers in this field of research experienced. For, not only the Flora of British India projected by Hooker has been completed, but Floras of most of the provinces of India have been in recent years prepared by some of the noted Indian botanists. Thus the Bengal Plants by Sir David Prain, the

Gangetic Flora describing plants of the United Provinces of Agra & Oudh by Mr. J. F. Duthie, Flora of Bombay by Dr. Theodore Cooke, Flora of the Central Provinces by Mr. Haines, Flora of Madras by Mr. Gamble, Panjab Plants by Colonel Bamber, Flora Simlensis by the late General Collett, Plants of Baluchistan by Mr. Burkill, and Flora of Assam under preparation by Rai Bahadur Upendra Nath Kanjilal, will be of great help to those who are interested in the study of the medicinal plants of this country. Of the Indian States of India, the plants of Kashmir were worked out principally by Jacquemont and Royle; of Nepal by Wallich and recently by Mr. J. H. Burkill; of Bhotan and Sikkim recently by Messrs. Burkill and Smith; of Cutch by Revd. Father Blatter; of Mysore in the Gazetteer Volume of that principality; and of Baroda and Kathiawad States by Mr. Jayakrishna Indrajit in Guzerati.

V.

The outlook is not so gloomy now as it was more than twenty-five years ago, when I commenced the study of the subject. The Petit Laboratory established in Bombay was almost the first institution intended to work out the pharmacology of Indian drugs. For this purpose, the late Dr. K. N. Bahadurji was appointed to its charge.

The Indian Medical Congress held in Calcutta in 1894 recorded the following resolution:—

“That it be recommended to the consideration of the Government of India that an extended use of indigenous drugs is most desirable.”

It was on this resolution that the Government of India appointed the Indigenous Drugs Committee which held their first meeting in Calcutta on January 3rd, 1896. In appointing this Committee, it was stated,

The points to which the Government of India desire more particularly to invite the attention of the Committee, with a view to their careful consideration, are the practicability, as well as the utility, of—

- (a) encouraging the systematic cultivation of medicinal plants indigenous to India;
- (b) encouraging the increased use in Medical Depôts of drugs of known therapeutic value; and
- (c) sanctioning the manufacture of stable preparations of certain drugs at the Depôts.

Regarding the above the Government of India desire that the Committee

should further consider, and report their opinion as to the action which would be best calculated to give the suggested encouragement. The Committee should further consider, from a practical point of view, the question of initiating, as a Government measure, experiments to test the *reputed* therapeutic value of indigenous drugs. The Government of India, as at present advised, are inclined to the opinion that such investigations can more profitably be left to the enterprise of private individuals.

This Committee has so far published two useful reports.

The Ayurvedic practitioners are holding conferences every year in different cities of this country, in which medicinal plants and drugs are exhibited. This will greatly advance the cause of the more extensive use of indigenous drugs. The chemistry of Indian medicinal plants is being investigated by several chemists in different laboratories of India, as is evident from their reports published from time to time in journals of Chemical Societies and of other learned institutions. The quarterly journal, named "Food and Drugs," of Calcutta, now defunct, published several interesting papers on indigenous drugs. There are also a few workers in Tata's Research Institute, Bangalore, investigating this subject. Fifty thousand rupees have been donated to the Tropical School of Medicine recently established in Calcutta, by His Highness the Maharaja of Durbhanga, and ear-marked for the investigation of the properties and uses of indigenous drugs.

But at present there is no Pharmaceutical Society or School of Pharmacy in this country to carefully study and investigate the subject of indigenous drugs. The establishment of such an institution is highly desirable; so also of farms of medicinal plants. Regarding the growing of medicinal plants, Mr. F. A. Miller writes in the Journal "American Pharmaceutical Association III, pp. 34-38" that the time has arrived to reduce the work of drug cultivation to an exact science and to determine the commercial possibilities of the most promising forms, in the same manner as has been done in agricultural and other economic farms.*

The present war, as mentioned before, emphasises the

* [Chemical Abstracts for February 20th, 1914, p. 786.]
Mr. R. P. Craford writing in Scientific American Supplement, September 8, 1917 on "Reducing drug plant cultivation to a science," says, "that drug plant cultivation is far from easy and the institution that works out these

necessity of extensively growing medicinal plants especially in India where, with little difficulty, economic plants of all lands can be cultivated.*

The establishment of medicinal farms in well selected localities* will exercise scientific control over the cultivation of medicinal herbs and plants. Regarding the advantages of conducting a farm of this nature Messrs. Burroughs Wellcome and Co., who have established such a one, write :—

" 1. A drug may be treated or worked up immediately it has been collected.

" 2. Herbs may be dried, if necessary, directly they are cut, before fermentation and other deteriorative changes have set in.

" 3. Freedom is ensured from caprice on the part of collectors, who, in gathering wild herbs, are very difficult to control in the matter of adulteration, both accidental and intentional.

" 4. Opportunity is provided to select and cultivate that particular strain of a plant which has been found by chemical and physiological tests to be the most active, and which gives the most satisfactory preparations."

We know there are many plants mentioned by Hindu medical authors which are not procurable now. We have to refer to such names as those of Kâkolî, Kṣîra kâkolî, Medhâ, Mahâ Medhâ, Jivaka, Riṣabha &c. Perhaps this extinction of valuable medicinal plants of ancient India is well explained by what Mr. J. L. Stengel writes in the *American Journal of Pharmacy* for 1912 (pp. 299 *et seq*) regarding Hydrastis that with the progress of civilisation the plant has diminished. He says that "the scarcity of this valuable drug cannot be entirely attributed to lack of plants

problems in connection with several score different plants has a difficult task ahead, but one which may pave the way toward American independence in drug science."

Scientific cultivation of drug plants in this country will make India independent in drug science.

* Lieutenant-Colonel Sir Leonard Rogers, M. D., F. R. C. P., K. C. I. E. I. M. S., the founder of the Calcutta Tropical School of Medicine is reported to have said before the Indian Industry Commission, that "most of the drugs imported into India were absolute refuse, and considering that one-half of the drugs in the British pharmacopoeia are indigenous to India and that most of the rest could be cultivated there is clearly an opportunity of developing an industry that has been almost neglected, and if India is to grow its own drugs it must take care that it gets them unadulterated."

or to extinction, but to other conditions, which tend to prevent identification at the time of collection." This shows also the necessity of rational cultivation, and hence of medicinal farms.*

Many have been disappointed from the use of indigenous drugs for which the cause is not far to seek. A writer in the *Calcutta Review* for 1869 (p : 199) said :—

"The distrust of bazar medicines is, we are convinced, well warranted by facts. In many cases bazar medicines are simple trash. Let any one only look at the system of storage followed in a *pansari's* shop, and one very evident reason of this will be apparent. His wares are of all degrees of staleness, the stock of many of them inherited from his father or grandfather and long ago inert. Stoppered bottles are things unknown, and all substances are alike stowed in bags or earthen vessels, exposed to every variation of the atmosphere in respect of heat and moisture, and to the attack of every kind of insect. * * * Many are adulterated, and as a matter of course, none are labelled."

The above also shows the necessity of medicinal farms and the establishment of depots for the supply of reliable preparations of indigenous drugs.

It is the bounden duty of educated Indians to do all that lies in their power for the proper study of Indian medicinal plants and drugs. In 1879, the *Calcutta Review* wrote :—

"The resuscitation of Indian medical science is a noble and useful work which ought to be performed by educated Hindoos. * * It is perfectly true that Indian drugs ought to be largely studied and used by medical practitioners in this country. European medical men fully admit this truth and some of them have labored earnestly and assiduously to accomplish this object. But it is easy to understand that the efforts of foreigners must be necessarily imperfect and unproductive of adequate results. Upon educated Indian members of the profession, therefore, devolves this great and solemn duty, for it is they alone who can discharge it adequately and well. * * In India the foreign and the indigenous systems ought to be read together if full benefit is to be derived from either."

B. D. BASU.

* A few enterprising Ayurvedic practitioners of Calcutta have established such farms in the neighbourhood of that city. But these are on small scale.

A NOTE.

In his interesting report on Punjab Drugs [in Baden Powell's Handbook of the Economic Products of the Punjab], the late Dr. Burton Brown wrote:—

"At the present day the native physicians have adopted, with some modifications, the idea of GALEN respecting the method of operation of medicines; this was, that the uses of all medicines were derived from their elementary or cardinal properties,—namely, heat, cold, moisture and dryness; and that all diseases could also be classed under the above heads, but that in the treatment of disease a medicine should always be employed which was of a contrary nature to the disease treated; thus a cold disease requires a hot remedy, and the converse.

The following is a list of some of the drugs employed, showing their nature according to native ideas, and also the real use in European medicine.

COLD MEDICINES.

Scientific name.	Native name.	Use.
Phyllanthus emblica ...	Amla ...	Astringent and acid purgative. 858
Rosa ...	Gul surkh ...	Astringent.
Rosa ...	Gulāb ...	Astringent and purgative.
Citrus aurantium ...	Narangi ...	Astringent, tonic.
Tamarindus indica ...	Imli ...	Refrigerant.
Terminalia chebula ...	Halela ...	Astringent.
Rhus coriaria ...	Samāk ...	Astringent.

HOT MEDICINES.

Semecarpus anacardium	Bhilāwa ...	Acrid.
Corylus avellana ...	Findak ...	Demulcent.
Dracocephalum Royleanum.	Bālangū ...	Aromatic. which always is taken
Zingiber officinale ...	Soñth ...	Aromatic.
Moschus ...	Mushk ...	Aromatic.
Aquillaria agallocha ...	'U'd ...	Tonic.
Caryophyllus aromatica	Karanful ...	Aromatic.
Amber ...	Kahruba ...	Tonic.
Narcissus tazetta ...	Nargas ...	Acrid.

DRY MEDICINES.

Prunella sp—, ...	Ustákhúds ...	Aromatic.
Raw Silk ...	Abresham ...	Inert.
Centauria Behmen ...	Bāhman ...	Tonic.
Polypodium ...	Bisfaj ...	Tonic.
Dracocephalum Royleanum.	Bālangū ...	Aromatic.
Psoralea corallifolia ...	Bābchi ...	Tonic.
Laurus cinnamomum ...	Dārchīni ...	Aromatic.
Laurus cassia ...	Taj ...	Aromatic.
Pastinaca ...	Shakākul ...	Demulcent.
Crocus sativus ...	Zafrān ...	Inert.
Mentha sativa ...	Pudina ...	Aromatic.
Myristica moschata ...	Jaiphal ...	Aromatic.

Scientific name.	Native name.			Use.
MOIST REMEDIES.				
Phyllanthus emblica	...	Amla	...	Astringent.
Tamarindus indica	...	Imli	...	Purgative.
Silica	...	Tabáshir	...	Inert.
Vitis vinifera	...	Zirishk	...	Demulcent.
Camphora	...	Káfúr	...	Aromatic.
Onosma sp—,	...	Gauzabán	...	Tonic.
Coriandrum sativum	...	Dhanyán	...	Aromatic.
Rosa	...	Gul súrkh	...	Astringent.
Nymphcea	...	Nilofar	...	Inert.
Citrus aurantium	...	Narangi	...	Aromatic.

From the above list it will be seen that many of the cold remedies, are what are used in European therapeutics astringent medicines, while the hot remedies are principally aromatics; but that very various remedies are classed under the terms moist and dry."

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INDIAN MEDICINAL PLANTS.

N. O. RANUNCULACEÆ.

1. *Clematis Nepaulensis*, D.C. H.F.BR.I., I. 2.

Syn. :—*C. montana*, Don.

Vern. :—Pawanne, birri, wandak. (Pb.) Ghantiali (Kumaon).

Habitat :—Temperate Himalaya, from Garhwal to Bhotan.

A slender, nearly glabrous climber. *Leaves* ternately divided, common petiole 1-1½ in. *Leaflets* 1-2 in. elliptic—lanceolate, sometimes very narrow, entire, toothed or 3-lobed, 3-nerved; lateral oblique, half as long as, or shorter than, the terminal leaflet or lobe which is 2-3 by ½-½ in. *Flowers* many, pedicels 1-2 in. long with 2 hyaline bracts joined into a cup, pubescent above the cup. Bud sessile in the cup. *Sepals* 4, erect, cream-coloured, oblong, silky outside. *Filaments* glabrous, tapering from a broad flat base; anthers short. *Achenes* flat, margined, hairy; style 1½ in. long, long in fruit.

Parts used :—The leaves.

Medicinal Properties and Uses :—In Kanawar, the leaves are said to act deleteriously on the skin. (STEWART).

The leaves and stems, since they contain an acrid principle which acts deleteriously on the skin, may be used for purposes of vesication.

N.B.—It is not improbable that *C. Nepaulensis*, D.C. and *C. barbellata*, Edgew., and some other species of *Clematis* are used for the same purpose as *C. Nepaulensis*, D.C. There is very little difference in the appearance of these species, and so they are very easily mistaken one for the other.

2. *C. triloba*, Heyne. H.F.BR.I., I. 3.

Sansk. :—Laghu karni.

Vern. :—Moravela, Morvel, Moriel, rânjâi (Bomb.).

Habitat :—Mâwal district mountains of the Deccan, and W. Concan.

An extensive climber. Leaves 1-2 in., silky small simple or one-ternate, entire or 1-3-toothed or lobed, elliptic-ovate or cordate, 3-nerved. Panicle many-flowered. Lower bracts leafy. Flowers $1\frac{1}{2}$ -2 in. diam., white. Sepals spreading from the base, 4-6, membranous, oblong, silky outside. Filaments glabrous, narrow-linear, connective of anthers not produced. Petals 0. Stamens many. Carpels many, with a pendulous ovule. Fruit—a head of achenes, with a long feathery style.

Parts used :—The leaves.

Medicinal Properties and Uses :—The juice of the leaves, combined with that of the leaves of *Holarrhena antidysenterica*, is dropped into the eye for the relief of pain in staphyloma; about 2 drops being used. Vaidya Rugnathji of Junagad says the whole plant is a purgative.

It is said to be used as a remedy in leprosy, blood diseases and fever by Sanskrit authors. (S. ARJUN).

3. *C. Gouriana*, Roxb. H.F.BR.I., I. 4. Roxb, 457.

Vern. :—Morvel, rânjâi (Bomb.), Marâthi; Belkun, Belkangau (N. W.).

Habitat :—In the hilly districts, from the Western Himalaya to the Eastern Peninsula, Ceylon, and the Western Peninsula.

An extensive woody climber. Stem thick, striate. Branches widespread, purple, pubescent when young. Leaves pinnate or bipinnate or biternate. Petiole and rachis elongated. Leaflets stalked, unequal, 2-3½ in. long, ovate, or oblong-lanceolate, acuminate, shining above, entirely or distantly toothed, cordate or rounded at base, rather coriaceous shining, wholly

glabrous above, slightly pubescent beneath. *Flowers* yellowish or greenish white, $\frac{3}{4}$ in. diam., small in dense axillary panicles. *Sepals* ovate or oblong, revolute, puberulous, $\frac{1}{2}$ - $\frac{3}{4}$ in., margins tomentose. *Filaments* narrow-linear. *Achenes* hairy, lanceolate, *Style* $1\frac{1}{2}$ -2 in. long, narrow oblong, in fruit very slender, hairy.

Medicinal Properties and Uses :—The leaves of the fresh stems, if bruised and applied to the skin, cause vesication. They abound in an acrid poisonous principle. WATT. ii. 369.

4. *Anemone obtusiloba*, Don. H.F.BR.I., I. 8.

Syn. *Anemone discolor*, Royle.

Vern. :—Rattan jog, Padar (Pb.). Kakriya (Kumaon).

Habitat :—Temperate and Alpine Himalaya, from Kashmir to Sikkim; altitude 9-15,000 ft.

A perennial herb, densely tufted, glabrate, or softly hairy.

Rootstock woody, fibrous, clothed with old root-sheaths. *Radical leaves*, many stalked, suborbicular, deeply cordate; *Segments* broad, cuneate, variously cut and lobed, rarely shortly petiolate. *Scapes* 6-12 in., 1-3-flowered; invol. leaves 3-fid. *Flowers* white purplish or golden; pedicels long, slender. *Sepals* silky outside, generally lead-coloured near the claw. *Achenes* strigose, rarely glabrous. Very variable in size, hairiness and colour of flower.

Parts used :—The root and seeds.

Medicinal Properties and Uses :—In Hazara the pounded root, which is acrid, is mixed with milk and given internally for contusions. In Bessahir it is said to be used as a blister, but to be apt to produce sores and scars (STEWART). The seeds, if given internally, produce vomiting and purging. The oil extracted from them is used in rheumatism. (WATT).

Anemonin is found in this plant.—It occurs in many of the *Ranunculaceæ*; it is a toxic substance, and produces paralysis of the central nervous system. The compound has the formula $C_{15}H_{12}O_6$, and is deposited in rhombic crystals melting at 152° . It is volatile with steam, and, on exposure to air at ordinary temperatures, is slowly converted into anemonic acid; the oxidation

proceeds more quickly if platinum black, hydrogen peroxide, or barium peroxide is employed. J. Ch. S. 1893 AI. 727.

(2) But in J. Ch. S. 1896 AI. 623, the formula given for Anemonin is $C_{10}H_8O_4$. It is also stated there that it yields methyl and ethyl derivatives, which are apparently ethereal salts, showing that it is the anhydride of a dicarboxylic acid. Dimethylanemonin, $C_8H_8(COOMe)_2$, melts at 109-110°, methylanemonin at 174-176°, diethyl anemonin at 47°, and ethylanemonin at 168-170°. (3) The said dicarboxylic acid is a ketonic acid. (4) By oxidation, anemonin yields succinic and oxalic acids. (5) By hydrolysis of the dialkyl salts before mentioned with alkali and amorphous acid, $C_{10}H_8O_4 + 2H_2O$ is formed, but hydrolysis of them with HCl yields a crystalline acid, $C_{10}H_8O_4 + H_2O$. The amorphous acid gives coloured, the crystalline acid colourless, salts. (6) Anemonin is a saturated compound, for by reduction it yields a saturated hydroxy-acid, and absorbs neither chlorine (Hübl's solution) nor bromine.

5. *Thalictrum foliolosum*, D.C. H.F.BR.I., I. 14.

Vern.:—Pinjari; Shuprak (root-pili-jari) (H.); Pila-jari, pengla jari, barmat (root-mamira) (Kumaon); Gurbiani, pashmaran, phalijori, Chitra-mul, Keraita, Mamira (Pb.); Chaitra (Kashmir); Mamiran (Bombay).

Habitat:—Temperate Himalaya; Khasia hills.

A tall perennial rigid herb. Stem 4-8 ft. glabrous. Leaves exstipulate, pinnately-decompound; petiole sheaths auricled. Leaflets $\frac{1}{8}$ - $\frac{1}{4}$ in. rarely 1 in., orbicular. Panicles much branched, bracts small. Flowers polygamous, white, pale green, dingy purple. Sepals 4-5. Petals 0. Stamens many, filaments filiform; anthers beaked. Ovule 1, pendulous. Achenes usually 2-5, small, oblong, acute at both ends, sharply ribbed.

Parts used:—The root.

Uses:—It has been found useful as a tonic. "I administered it in the form of a tincture to some extent when at the European General Hospital, Bombay, and found it a good bitter tonic, comparable with gentian." (DYMCK.).

The root is largely used as an *anjan*, or application for ophthalmia in Afghanistan and throughout India.

In the Punjab, the root is used as a purgative and diuretic. (BADEN POWELL).

The bruised root having been given to large dogs in the quantity of 10 grs. to 2 ounces, no particular effects were observed.

"It has been used in the Hospital of the Medical College in several cases of ague, and as a tonic in the convalescence from acute diseases.

"5 grs. of the powder, or 2 grs. of the watery extract, given thrice daily, have in some cases prevented, and in several moderated, the accession of fever, and at the same time acted gently on the bowels. The only sensation experienced was warmth at the epigastrium, and a general comfortable feeling.

"Another species of *Thalictrum* (flavum) is common in France, where it is termed 'the poor man's rhubarb,' as a substitute for which medicine it is generally employed. The Indian species is easily procurable from the hills, though not known in the bazars of the lower provinces.

"It deserves extensive trial, and promises to succeed well as a febrifuge of some power, and a tonic aperient of peculiar value.

"Dose of the powder.—5 to 10 grs. as a tonic and aperient, in the interval of intermittent fevers, and in convalescence from acute diseases." (O'SHAUGHNESSY).

"It lessens the intensity of fever, and acts gently on the bowels; thus it is a good substitute for rhubarb. As collyrium, it clears the sight. The snuff prepared from it clears the brain. It relieves toothache." (R. N. KHORY).

6. *Ranunculus scleratus*, Linn. H.F.BR.I., I. 19.

Syn.:—*R. Indicus*, Roxb. 458.

Vern.:—Kaf-es-saba (Arab.); Kabikaj (Pers.). Polica (Tirhut); Shim (Kumaon).

Habitat:—River banks in Bengal and Northern India; marshes of Peshawar; warm valleys of the Himalaya; unknown south of the Nerbudda.

An annual glabrous, erect yellow-green herb.

Stem usually 6-12 in., sometimes 1-3 ft., succulent, hollow. *Radical leaves* $\frac{1}{2}$ -1 $\frac{1}{4}$ in. across, long-stalked, deeply 3-lobed, segments lobed, obtusely toothed, near the top. *Stem leaves* shortly stalked, 3-parted, segments narrow, lobed and toothed. *Flowers* $\frac{1}{4}$ - $\frac{1}{2}$ in. diam., numerous, petals pale-yellow. *Sepals* reflexed. Receptacle oblong, hairy. *Achenes* glabrous, in oblong heads, ultimately becoming cylindrical and longer.

Parts used :—The whole plant.

Uses :—It was formerly used in Europe by professional beggars to produce or maintain blisters or open sores intended to excite sympathy. ROXBURGH remarks that it has no native name, and that its properties are apparently unknown. It certainly possesses a very powerful principle, and one would expect to find it taking a place in the practice of herbalism. Water distilled from a decoction retains its acrid character, and, if this be allowed to slowly evaporate, it leaves behind a quantity of highly insoluble crystals of a very inflammable character.

The fresh plant is poisonous, and produces violent effect if taken internally. The bruised leaves form an application to raise blisters, and may also be used to keep open sores caused by vesication, or by other means (MURRAY).

7. *Caltha palustris*, Linn. H.F.B.R.I., I. 21.

Vern. :—Mamiri, baringû (Pb.).

Eng. :—The marsh marigold.

Habitat :—Marshes of the Western temperate Himalaya, from Kashmir to Nepal, altitude 8-10,000 feet Simla, common on marshy grounds of Chor.

A glabrous perennial herb. *Rootstock* thick, creeping. *Stems* 6-18 in. often tufted, erect, robust. *Leaves* shining, chiefly radical, 2-5 in. across, long-stalked, orbicular or kidney-shaped, deeply serrate; teeth small, close, regular. *Stem-leaves* alternate, smaller, the upper sessile, embracing the stem like an involucre. *Flowers* regular, few, 1-2 in. diam., terminal. *Sepals* 5-6, petal-like, bright yellow, oval or oblong-obtuse,

imbricate. *Petals* none. *Stamens* many. *Carpels* many, sessile, many ovuled, *Style* short, curved.

Fruit a head of narrow, flattened, many-seeded follicles, beaked with the persistent styles.

Use:—In Hazara, the root is considered poisonous. (STEWART).

8. *Coptis teeta*, Wall. H.F.BR.I., I. 23.

Vern.:—Tita (Ass); Mahmira (Sind); Mamira (H.).

Habitat:—Met with in Mishmi mountains, east of Assam, in temperate regions.

Small stemless herbs.

Rootstock horizontal, perennial, golden yellow, woody, densely fibrous, very bitter. *Leaves* ternatisect, glabrous, petioles 6-12 in.; leaflets 2-3 in., ovate-lanceolate, pinnatifid, lobes incised, terminal largest. *Scape* equalling the leaves. *Flowers* 1-3—pedicelled, regular, small, white on slender leafless scapes. *Bracts* leafy. *Sepals* 5-6, $\frac{1}{2}$ in. oblong—lanceolate, acute. *Petals* 5-6, narrow, ligulate, obtuse, $\frac{2}{3}$ shorter than the sepals. *Carpels* pedicelled, spreading. *Ovules* many. *Follicles* many-seeded. *Seeds* with a black crustaceous testa. Mishmi nuts, Bengal.

Part used:—The root.

Use:—It is a bitter tonic, useful in fevers and atonic dyspepsia.

9. *Delphinium denudatum*, Wall. H.F. BR. I., I. 25.

Vern.:—Nirbisi, judwâr (H.); Nilobikh (Nepal); Mûnila (Simla).

Habitat:—West temperate Himalaya, from Kashmir to Kumaon, in grassy places.

Glabrous or slightly downy herbs. *Stems* 2-3 ft. branched. Radical—leaves 2-6 in. across, orbicular, long-stalked, divided

nearly to the base, segments 5-9, narrow, pinnately lobed, often toothed; stem-leaves few, shortly stalked, upper sessile, more or less deeply 3-lobed, lobes narrow, mostly entire. *Flowers* few, scattered, 1-1½ in. long, spur cylindric, nearly straight. *Sepals* spreading, varying from deep-blue to faded grey. *Petals* blue, the lateral ones 2-lobed, hairy (Collett). Anterior petals deeply 2-fid, hairy on both surfaces. *Follicles* 3, inflated, glabrous or sparsely hairy. (Hk. F. and Thoms.).

Use:—The root is used in Bashahr for toothache and also as an adulterant for aconite (STEWART).

An alkaloid, introduced into commerce under the name of delphocurarine (Merck) has been extracted from the roots of a number of *Delphinium*s by means of an 80 per cent. solution of alcohol containing tartaric acid. Delphocurarine consists, in reality, of a mixture of bases, and behaves physiologically like curare (compare Lohmann, Pflüger's Archiv 1902, XCII, 398). It forms a white, amorphous powder which has a very bitter taste and an alkaline reaction, and is readily soluble in dilute acids. A small quantity of crystalline compound, $C_{23}H_{33}O_7N$, has been isolated from delphocurarine by means of ether and a mixture of light petroleum; it crystallises in needles, melts at 184°-185°, is rather readily soluble in alcohol, ether, chloroform, or benzene, but only sparingly so in light petroleum, and contains 18 per cent. of methoxyl. The platinum and gold salts form pale reddish yellow powders, the former containing Pt. 13.69 per cent. and the latter Au 25.29.

J. Ch. S. 1903, AI. 650.

10. *D. cæruleum*, Jacq. H.F.BR.I., I. 25.

Vern.:—Dakhanga (Pb.).

Habitat:—Alpine Himalaya, from Kumaon to Sikkim.

An erect herb. *Stem* 3-12 in., much-branched from the base, leafy, spreading. *Leaves* suborbicular, 1¼-1½ in. diam., 5-7 lobed, lobes cuncate-oblong, incised or pinnatifid, segments linear. Radical leaves divided to the base. *Flowers* solitary in long branches or few in a loose raceme, pale blue, hairy. *Sepals* shorter than the nearly straight spur. Spur subulate. Anterior petals obovate or obcordate, a little hairy. *Follicles* 5, hairy.

Use:—The root is applied to kill the maggots in the wounds of goats. (STEWART.)

11. *D. Brunoianum*, Royle. H.F.BR.I., I. 27.

Vern.:—Nepari (Kumaon); Kasturi (Garhwal); Sapsulu

(Ravi); laskar, spet, panni supalû, ruskar, liokpa (Sutlej); Ladara (Ladakh); Mûndwâl (Pangi).

Habitat :—Alpine, West Tibet.

An erect herb. *Stem* glabrous or downy below, glandular pubescent above, 6-12 in., simple below, leafy. *Leaves* 5-fid to the middle, lobes sharply cut or toothed, 3-4 in. diam. lobes cuneate-ovate, petioles very long. *Inflorescence* corymbose; corymbs sometimes compound. *Flowers* large, pale blue, hairy; tracts 3-5—partite, upper simple, oblong or linear, *Sepals* connivent, 1 in., membranous, orbicular, veined; longer than the conic and inflated spur. *Follicles* 5-6, $\frac{3}{4}$ in., viscidly pubescent.

Uses :—The juice of the leaves of this plant is used in Kurram to destroy ticks in animals, but chiefly when they affect sheep. In Leh it is considered so poisonous that the dew from the leaves falling on grass is said to poison cattle and horses. (AITCHISON).

“It is remarkable for the very powerful odour of musk, which is not peculiar to this species of the genus, but exists in other high alpine species, which form a peculiar group, with large half-closed membranaceous flowers, whence the mountaineers erroneously suppose that the musk-deer feed upon them, and thereby communicate the peculiar odour to their glandular secretions. The *D. Moschatum*, Munro is now, by Hooker and Thomson, rightly referred to the present plant.”

Some other species of *Delphinium* are also used medicinally, or their roots are employed to adulterate Aconites. Thus *Delphinium Cashmirianum*, Royle, (H. F.B.R.I., 1. 26), *Fig* :—Royle Ill. t. 12, found in West Tibet and Tibetan Himalaya, from Kumaon to Kashmir, and called in Punjabi *Amlin*, is used to adulterate Aconites; since, according to Atkinson, the cylindrical tuberous roots of this plant are absolutely identical with the ordinary *nirbisi* roots.

ACONITE.

There are about 24 Indian species of Aconite which may be classified as (a) non-poisonous and (b) poisonous. The poisonous

properties are due to the roots containing *bikhaconitine*, *pseudo-aconitine*, or *indaconitine*.

The non-poisonous Aconites, the active principles of which are either *Atisine* or *Palmatisine*, are (i) *A. heterophyllum*, Wall.; (ii) *A. palmatum*; (iii) *A. rotundifolium*; (iv) *A. violaceum*.

The poisonous aconites are (i) *A. falconeri*, (ii) *A. laciniatum*; (iii) *A. lethale*; (iv) *A. spicatum*; (v) *A. deinorrhizum*; (vi) *A. Balfourii*; (vii) *A. Chasmanthum*; (viii) *A. soongaricum*.

12. *Aconitum lycotonum*, Linn. H. F. BR. I., I. 28.

Vern.:—Bika (H); Khanik-El-Zeb (Arab.).

Habitat:—Himalaya, from Chitral to Kumaon, mostly in forests, locally abundant, from 5,000—12,000 ft. Kashmir.

Root perennial, elongate, more or less cylindric, ultimately breaking up into separate or anastomosing strands. *Stem* erect, simple, 3-6ft., glabrous or pubescent, much branched. *Leaves* palmately deeply 5-9-lobed, 6-10 in. diam., lobes cuneate-ovate; lower leaves long-petioled, upper sessile. *Racemes* branched, long, tomentose, bracts minute. Flowers pale yellow or dull purple, variable in size; helmet with a short beak and long cylindrical dorsal prominence. *Follicles* 3, spreading; testa plaited.

Uses:—This species also yields much of the aconite of European commerce.

Dr. Stapf writes:—The root does not appear to be used medicinally, and its chemistry is unknown. Dr. Jowett's notes quoted by Dr. Watt, in *Agric. Ledger* 1902, No. 3, p. 89, refer to the chemistry of the European *A. Lycotonum*.

13. *A. palmatum*, Don. D. Prodr. H. F. BR. I., I. 28.

Vern.:—Bikhma, Vakhama (Bomb.); Vakhamo (Guzr). Bis-hawa (H.)

Habitat:—Alpine Himalaya of Nepal, Sikkim and the adjoining part of South Tibet, from 10,000-16,000 feet.

Roots biennial, paired, tuberous; daughter-tuber shortly conic to long-cylindric, often irregularly shaped, 4 to more than 10 cm. long, 0.75-3 cm. thick, simple or branched, sometimes flexuous or twisted, bearing root-fibres, some of which are thread-like from the base and break off easily, while others are much thickened at the base or thick-cylindric, light-brown, smooth, fracture more or less horny and brownish in the thickest part of full-grown samples, almost farinaceous and white towards the tips and in the root-branches, cambium discontinuous, forming isolated strands of very varying shape and size, cylindric or tangentially flattened or crescent-shaped in cross-section, taste purely and persistently bitter; mother-tubers similar, but smaller, shrunk more or less hollow, and brown internally. *Innovation-bud*, short, conic from broad base. *Stem* erect, sometimes shortly flexuous in the upper part, simple or nearly so, inclusive of the inflorescence, 2-4 ft. high, stout, hollow, shining, glabrous. *Leaves* scattered, rather distant, up to 10, rarely more, the lowest usually withered at the time of flowering, quite glabrous, or the uppermost finely pubescent on the nerves below; petioles slender, 4-10 cm. long; blade orbicular-cordate to reniform with a very wide sinus (1-2 cm. deep), 6-10 cm. high from the sinus to the tip, 7-15 cm. across 5-or the uppermost 3-palmate-partite to $\frac{4}{5}$ or $\frac{3}{4}$, rarely more (to $\frac{5}{8}$ in the inner incisions), divisions obovate-cuneate to broadly lanceolate-cuneate or the outermost trapezoid, 3-lobed to about the middle or the outermost 2-lobed, intermediate lobe often elongated like others, acutely inciso-dentate or apiculately crenate. *Inflorescence*:—A very loose leafy panicle or raceme, 10-20 cm. long, glabrous, or pubescent in the upper part; rhachis rather slender; floral leaves, like the preceding cauline leaves, passing into the ovate or deltoid, dentate, shortly petioled bracts; bracteoles similar to bracts, but smaller, and sparingly dentate or entire, above the middle of the pedicels or even close to the flower; pedicels slender, curved, ascending, ultimately more erect, the lower up to 10 cm. long. *Sepals* bluish, or variegated white and blue, glabrous at least outside; uppermost helmet-shaped, helmet obliquely semi-orbicular (from the side) or more depressed and gaping very shortly or obscurely

beaked, 20-24 mm. high, 18-24 mm. long from tip to the base, 10-12 mm. wide (seen from the side), lateral margin very slightly concave or almost straight, lateral sepals contiguous with the helmet, obliquely orbicular-quadrate, not clawed, 18-20 mm. long; lower sepals obliquely oblong or elliptic—obtuse to acute, 12-15 mm. long. *Nectaries* glabrous, extinguisher-shaped; claw erect, or the upper-end more or less leaning forward, 16-18 mm. long; hood sub-cylindric, 4-8 mm. long, oblique to almost horizontal, top gibbous posteriorly, honey-gland occupying the gibbosity or the whole top, lip extremely short, crenulate, very broad. *Filaments* glabrous, 8 mm. long, narrowly winged to or beyond the middle, wings gradually alternated. *Carpels* 5, subcontiguous in the flower, but soon diverging, narrowly oblong, gradually passing into the short style, quite glabrous. *Follicles* subcontiguous or somewhat diverging in the upper part, oblong, obliquely truncate, 2.5-3 cm. long, 5-6 mm. broad, loosely reticulate. *Seeds* blackish, obovoid, about 3 mm. long, round in cross-section, obscurely winged along the raphe, transversely lamellate, lamellæ dark, undulate.

Uses:—Nothing definite is as yet known of the medicinal properties of this root. It is believed to be non-poisonous as well as tonic and antiperiodic.

It has also earned some repute in the treatment of cholera (SAKHARAM ARJUN).

From the roots of this, an alkaloid, named *Palmatisine* has been isolated at the Imperial Institute, which crystallises well, and in some respects resembles atisine. J. Ch. S. 1905T, 1655.

14. *A. ferox*, Wall. H. F. BR. I., I. 28.

Habitat:—Temperate, sub-Alpine Himalaya, from Sikkim to Garhwal.

Sanskrit:—Visha (Poison); Vatsanâbha (resembling the navel of children).

Vern.:—Bish, bachnak, mitha zahar; Singyabish; telyabish (H.); Kat bish, Mitha bish, Sringibish, (Beng.); Bachnâg (Mar.); Vashanavi (Tam.); Vasanabhi, nabhi (Tel.); Vatsanabhi (Mal.); Vasanabhi (Kan.). Shingadio-Vachnâg (Guz.).

Roots:—biennial, paired, tuberous; daughter-tuber ovoid-oblong to ellipsoid, 2.5-4 cm. long, about 1-1.5 cm. thick, with a few filiform root-fibres, dark-brown externally, fracture scarcely farinaceous, yellowish, taste rather indifferent, followed by a strong tingling sensation, cambium continuous, forming in cross-section a slightly sinuous ring; mother-tuber much shrunk and wrinkled, with numerous root-fibres, outer sieve-strands, surrounded by a mantle of sclerenchymatic cells. *Innovation bud* conic, 4-5 mm. long; scales ovate, prominently finely nerved, persistent. *Stem* erect, with or without a slender hypogæous base (up to 3 cm. long) which emits numerous fine roots near the upper end, simple erect, 40-90 cm. high, rather slender, covered with short spreading yellow hairs in the upper part, glabrous below, hollow. *Leaves* scattered, distant, excepting the lowest 2 or 3 which are usually delayed at the time of the flowering, up to 7, glabrous, or the uppermost very sparingly hairy; petioles slender, the lower up to 25 cm. long and much dilated at the base, uppermost very short; blade orbicular-cordate to reniform in outline with a rather wide sinus (up to 8 cm. deep) up to 11 cm. high from the sinus to the tip, up to 20 cm. across, 5-pedati-partite to the very base or almost so in the inner, and to $\frac{5}{8}$ - $\frac{2}{10}$ in the outer incisions, divisions deltoid from a cuneate base on the outermost trapezoid, intermediate division 3-lobed to the middle, middle lobe elongate, pinnate-laciniate to inciso-dentate, ultimate segments or teeth acute or very acute, inner lateral divisions similar, but less symmetric, outermost 2-lobed or 2-partite, all laciniae, more or less linear-lanceolate and divaricate, the outermost overlapping and thus closing the sinus; uppermost blades, sessile or subsessile, much smaller or dissected. *Inflorescence* a loose raceme 10-25 cm. long, often with slender, erect, few-flowered additional branches from the leafy base; rhachis slender, densely yellow-pubescent to sub-tomentose; floral leaves like the preceding leaves, but much reduced, passing upwards into trifid or entire and linear-lanceolate bracts; bracteoles at or below the middle, resembling reduced bracts, very often suppressed; pedicels slender, erect, the lowest at length up to 7 cm. long. *Sepals* blue, hairy; uppermost helmet-shaped, helmet semi-orbicular in profile, shortly beaked

20—24 mm. high, 17—20 mm. from tip to base, 7—9 mm. wide; lateral sepals slightly contiguous with the helmet, oblique, orbicular-obovate, broadly clawed, 16 mm. long, 14 mm. broad; lower sepals deflexed, oblong subacute, 10 mm. long. *Nectaries* glabrous; claw erect; hood oblique to subhorizontal, oblong, gibbous on the back; lip deflexed, lanceolate, acute, entire. *Filaments* glabrous, about 7 mm. long, narrowly winged, wings gradually alternate. *Carpels* 5, conniving and contiguous, tomentose, gradually passing into the style. *Follicles* oblong, obliquely subtruncate, 15—20 mm. long, 4-5 mm. broad, dorsally sub-convex, loosely tomentose or at length almost glabrous, conspicuously reticulate. *Seeds* obovoid or obpyramidal, 2.6—3 mm. long, winged along the raphe, transversely lamellate on the faces, lamellæ undulate.

Habitat :—Alpine Himalaya of Nepal.

Part used :—The root.

Uses :—This drug is officinal in both the British and Indian Pharmacopœias.

Extremely poisonous as the name indicates. It is very probably, says Stapf, the source or one of the sources of the "Bish Bikh" or "Hodoya Bish" of Hamilton.

"A few years ago I took the white variety, *Bachnâg*, myself in small quantities, and found that its internal use is not attended with more danger than that of the European aconite root (*Aconitum Napellus*). Since that period, I have employed it very extensively in my practice, and do not hesitate in saying that it is one of the most useful medicines in India. Its beneficial influence over diabetes is very remarkable, the immoderate flow of urine beginning to diminish from the very day of its use, with a proportionate decrease in the saccharine matter. Its control over spermatorrhœa and incontinence of urine is equally great. It has lately been found useful in some cases of paralysis and leprosy. The advantages of this drug over all other varieties of the Indian aconite root are that it is not only much milder, but also more certain and uniform in its actions." (MOHIDEEN. SHERIFF).

15. *A. Napellus*, Linn. H.F.BR.I., I. 28.

Vern. :—Dudhiabish ; Katbish ; Mithā-Zahar ; Tilia cachang ; Mohri (Kashmir and Panjab Himalayan names). The root in Kashmir is called *Ban-bal-nâg*, Vasa nabhi (Tel.) ; Dudhio Vachanâg (Guz.).

Habitat :—Temperate, Alpine Himalaya, from 10,000 feet to the highest limit of vegetation in the N.-W. Provinces.

An annual erect herb, starting from an elongated tuberous conical rootstock. *Root* 2—4 in. long, and sometimes as much as an inch in thickness. This root tapers off in a long tail, while numerous branching rootlets spring from its side. If dug up in the summer, it will be found that a second and a younger root (occasionally a third) is attached to it, near its summit, by a very short branch and is growing out of it on one side. This second root has a bud at the top which is destined to produce the stem of the next season. It attains its maximum development at the latter part of the year, the parent root, meanwhile, becoming shrivelled and decayed. The dried root is more or less conical or tapering, enlarged, knotty at the summit, which is crowned with the base of the stem. It is from 2—3 or 4 inches long, and at the top from $\frac{1}{2}$ —1 in. thick. A transverse section of a sound root shows a pure white central portion (pith) which is many-sided and has at each of its projecting angles a thin fibro-vascular bundle. (Flückiger and Hanbury). *Stem* :—Stiff upright herbaceous, simple, 3-4ft. high, clothed at its upper half with spreading dark-green leaves, which are paler on their underside ; glabrous or slightly pubescent, often decumbent. *Leaves* 3—5 or more inches long, nearly half consisting of the channelled petiole, palmati-partite ; very variable in size. The blade which has a roundish outline, is divided down to the petiole into three principal segments, of which the lateral are sub-divided into two or even three, the lowest being smaller and less regular than the others. The segments, which are trifid, are finally cut into 2 or 5 strap-shaped pointed lobes. The leaves are usually glabrous and are deeply impressed on their upper side by veins which run with but few branchings to the tip of every lobe.

The uppermost leaves are more simple than the lower, and gradually pass into the bracts of the beautiful raceme of dull blue helmet-shaped flowers which crown the stem. The taste of the leaves is at first mawkish, but afterwards persistently burning. The taste of the fresh root has a sharp odour of radish which disappears in drying. Its taste which is at first sweetish soon becomes alarmingly acrid, accompanied with a sensation of tingling and numbness. (Flück. and Hanb.). Flowers $\frac{3}{4}$ -lin., long. "Bright or dull greenish blue" (Hk. f., and Thoms.). *Sepals* 5, petaloid, posterior (helmet) vaulted, the rest flat. *Petals* 2-5, two posterior clawed; limb hooded and enclosed in the helmet. *Helmet* shallow, tapering to a slender beak, 3 times as long as high. *Racemes*:—Simple, few- or many-flowered, or sparingly compound. Bracts entire or trifid. *Stamens* many. *Follicles* 3-5 in. in Indian forms; hairy, sessile. *Seeds* many. *Testa* smooth. This is a very variable plant.

"Recent investigations into the Chemistry of the Indian Aconites, and my own examination of a great mass of herbarium material, many times richer than that which was at the disposal of the authors of the *Flora Indica*, as well as histological studies concerning the root-tubers of the Indian Aconites, have convinced me that the European *Aconitum Napellus* does not occur in India, either in its typical form or what we might be justified in calling varieties of it." (Annals of the Royal Botanic Garden, Calcutta, Vol X, p. 121. 'The Aconites of India' by Dr Otto Stapf).

Part used:—The root.

Use:—Its febrifuge and tonic properties are mentioned in all works on *Materia Medica*.

16. *A. heterophyllum*. Wall. H.F.B.R.I., I. 29.

Syn.:—*A. cordatum*, Royle.

Sanskrit:—Sanskrit writers describe two varieties of this root:—(1) white and (2) black. The synonyms of the white variety are:—Ativisha (very poisonous); Sukla Kanda (white root); Visha (poisonous); Prativisha (Counter-poison or antidote). The Synonyms of the second variety are:—Shyâma

Kanda (black root) ; Sitashringi (white-horned) ; Bhangura (frail) ; Upavishanika (the horns or rootlets turned upwards).

Vern :—Atis (H.) ; Ati-vadayam (Tam.) ; Ati-vasa (Tel.) ; Mohand-i-gujsafed ; hong-i-Safed (Kashmir) A'is (Bhotie) Sukhi-hari, Chitijari ; Patris or Patis ; bonga (Pb.) ; Atavishni-Kali ; Ativish or Ativakh (Guz.) ; Ativish (Mar.).

Habitat :—Common in the Subalpine and Alpine Zone of the Himalaya, from the Indus to Kumaon, from 6,000 to 15,000 ft.

Stem :—Erect, leafy, 1-3ft., simple or branched from the base, glabrous below, puberulous above. *Leaves* 2-4 in. broad ovate or orbicular. Cordate, acute or obtuse ; cauline sharply toothed, the lowest long-petioled and not amplexicaul. *Racemes* often paniced, many-flowered. Bracts sharply toothed, upper 3-fid or entire. *Flowers* more than 1 in. long, bright blue, greenish blue, with purple veins. *Helmet* half as high as long, shortly beaked. *Follicles* 5, downy. *Testa* smooth.

The roots contain an alkaloid, *atisine*, $C_{22}H_{31}NO_2$, (*Alder Wright*) or $C_{26}H_{34}N_2O_5$ (*Broughton*). (See *Sohn*, p. 4.) and *Aconitic acid*, $C_6H_6O_6$.

In *Dymock's Mat. Medica. of W. I.*, (2nd edition, p. 7), it is said :—"The English notices of this are to be found in Hindu works on *Materia Medica*, *Shârangdhar* and *Chakradatt*, where it is recommended as a remedy in fevers, diarrhœa, dyspepsia and cough, also as an alexipharmic." "The author of the *Makhzan-ul-Adwiya* says it is aphrodisiacal and tonic, checks diarrhœa and removes corrupt bile." Up to very recently, English physicians in India administered it as an antiperiodic in doses of about 30 grains, every 6 or 4 hours. Dr. M. Sheriff considers that the ordinary doses are only useful as a tonic, and that 2 drams or more should be given as an antiperiodic. Probably, says Dr. Dymock, the native estimate of the drug, as given above from the *Makhzan*, is not far from truth, *viz.*, that it is tonic and digestive and often useful in dyspepsia with diarrhœa (*Pharmacographia Indica*, Vol. I., p. 16, 1890, Bombay). Dr. Tribhuvandas. M. Shah of Junagadh says it is anthelmintic and antifebrile, in doses of 10-30 grains. It can be given to children in fevers.

The alkaloid *Atisine* of Broughton, from experiments made on rabbits, appears to be non-poisonous. (Dymock). Dr. Dymock says that *Atis* is an ingredient in *Bâl-Goli*, a pill given to infants to keep them quiet, which contains thirty-one drugs, of which three are narcotics, viz., Bhang, opium and *Datura*, and the remainder bitters, aromatics. (Ph. Indica, p. 15, Vol. I.)

Part used:—The root.

Use:—The root is officinal in the Indian Pharmacopœia. Tonic and antiperiodic properties are attributed to it.

17. *A. Soongaricum*, Stapf.

Stapf writes:—"Of all the Indian species of *Aconitum* which I have seen, this comes nearest to the *A. Napellus* of Europe; and if that species is taken in a broad sense, *A. Soongaricum* might perhaps be included in it as a variety, the principal differences being in the small size and shape of the tubers and the peculiar long-beaked helmet. The long, linear, usually entire laciniae of the leaves also are unusual in *A. Napellus*; still they occur occasionally. The fruits and seeds may possibly, when known, add other distinctive characters." (l. c. p., 142.)

Vernacular name—unknown.

Habitat:—Alpine region of the mountain ranges of Gilgit and Turkestan.

Roots:—Biennial, paired; tuberous: daughter-tuber conic, slender, 2-2.5 cm. long 0.7 cm. thick, with very few root-fibres, brown externally, fracture horny, brown, taste faintly sweetish bitter, followed by a very slight tingling sensation, cambium continuous, forming a scarcely sinuous ring in cross-section; mother-tuber similar, more or less shrunk. *Innovation-bud* conic, about 5 mm. long; scales scarious, soon decaying or sprouting. *Stem* erect, simple, moderately robust, quite glabrous, rarely slightly pubescent in the upper part, up to 7 dm. high. *Leaves* scattered, lowest usually decayed at the time of flowering, intermediate remote, upper more approximate, glabrous; petioles more or less widened at the base; lower up to 12 cm. long, upper 1-2 cm. long; blades more or less cordate-orbicular or reniform in outline, with a wide or narrow sinus, 2-3 cm. deep; 5-9 cm. from the sinus to the tip, 8-12 cm. across, 5-partite to the very base or in the outer incisions almost to the base; inner 3 divisions similar, rhomboid in outline from a narrow cuneate

base, 2.5—3.5 cm. wide, 3-lobed to or beyond the middle or pinnate-laciniate, lobes or laciniae broad-linear, obtuse to shortly acute 1.5-3 cm. long, 3-5 mm. broad, entire or the larger with 1-2 coarse teeth or linear lobules, outer divisions 2-fid beyond the middle, inner segment 2-3-lobed, outer often entire, linear. *Inflorescence* an erect dense or somewhat loose, terminal raceme 6-18 cm. long, or with additional branches from the upper leaves, glabrous or sparingly softly pubescent; lower bracts foliaceous, 3-partite, with mostly entire long linear segments, considerably exceeding the pedicels, intermediate linear, entire, up to 2.5 cm. long, upper filiform, short; pedicels slender, erect or often adpressed to the rhachis, lower 1.5—2.5 cm. long; bracteoles linear, above the middle of the pedicel, sometimes close to the flower. *Sepals* blue, pubescent, ciliate; uppermost helmet-shaped; helmet clawed, equally curved on the back and in front (seen in profile), descending into a long slender beak, lateral margin deeply concave, 16-18 mm. high, 12-15 mm. from the tip to the base, 5-6 mm. wide at the top; lateral sepals oblique, obovate-orbicular, shortly clawed 13-17 mm. long, not contiguous with the helmet; lower deflexed, sub-horizontal, elliptic to oblong, obtuse or sub-obtuse, 10-15 mm. long. *Nectaries* glabrous; claw slender up to 12 mm. long; hood erect, 5 mm. long, top gibbous at the back; lip oblong-ovate, crenulate, as long as the hood. *Filaments* glabrous or sparingly hairy in the upper part, 7-8 mm. long, winged below, wings gradually or abruptly contracted. *Carpels* 3 lanceolate-oblong, gradually passing into the style, somewhat diverging, glabrous or almost so. *Mature Follicles* and seeds unknown. Young follicle distinctly diverging, inserted on the enlarging torus.

Use.—"The root does not appear to find its way to the bazârs of India. This species has not as yet been chemically investigated, and it is just possible that it may be found to contain *aconitine*."—(Watt).

18. *A. Chasmanthum*, Stapf. Annals Royal Bot. Gard. Calcutta, Vol. X. pt. II., p. 142.

Vern.—Mohri (Jhelum Basin); Piun (Jhelum Basin); Ban-bal-nag (Kashmir.)

Habitat :—Subalpine and Alpine zone of the Western Himalaya from Chitral and Hazara to Kashmir, between 7,000 and 12,000 ft.

Roots :—Biennial, paired, tuberous ; daughter-tuber conic to conic-cylindric from a broad base, 2.5-3.7 (rarely 5) cm., 12-18 mm. thick, bearing more or less numerous root-fibres, leaving behind the indurated bases when breaking off, bark brown to blackish brown, smooth or wrinkled when dry, fracture cartilaginous, hard, white within the cambium ring, brownish without ; taste slightly bitter, followed by a very persistent strong tingling sensation, cambium continuous, forming a wide central strand, sinuous in cross-section ; mother-tuber shrunk, deeply grooved and wrinkled, black outside, brown right through. *Innovation-bud* conic, short from a very broad base. *Stem* erect, simple, inclusive of the inflorescence, 60-120 cm. high, rather stout, crispo-pubescent above, glabrous below, or almost glabrous all along. *Leaves* numerous, usually more distant in the lower part and crowded in the upper, or more equally distributed, the lowest on petioles up to 7.5 cm. long, the upper shortly petioled or subsessile, passing into the floral leaves, quite glabrous, somewhat fleshy, lower and intermediate blades orbicular, reniform in outline, 4-6 cm. high, 5-9 cm. across, 3-palmate-partite almost to the very base, intermediate segment obovate-cuneate, long attenuated at the base, 3-lobed to the middle or beyond, lobes liciniate, or the middle lobe pinnate-partite, ultimate liciniæ linear, acute to very acute, lateral segments deeply 2-partite and liciniate with the inner division, similar to the intermediate segment and the outer 2-lobed and smaller, uppermost lobes similar to the preceding, but smaller, relatively longer and more sparingly divided. *Inflorescence* a long, narrow, stiff, dense or loose raceme, often over 30 cm. long, often leafy below, and sometimes with slender, erect additional branches from the base, crispo-pubescent ; rhachis stout ; floral leaves like the preceding leaves, but still less divided or entire, passing into the linear to filiform bracts ; bracteoles, if any, small ; pedicels slender, the lowest at length 2.5-3.5 cm. long and adpressed to the rhachis when mature. *Sepals* blue or whitish and variegated with blue, crispo-pubescent

or almost glabrous; uppermost helmet-shaped, helmet more or less depressed into a distinct and often long and slender beak. 15-10 mm. high, 12-18 mm. long, from the tip to the base, 5-7 mm. wide (seen from the side), lateral margin conspicuously concave, lateral sepals not contiguous with the helmet, except near the base, obliquely suborbicular or almost square, shortly or obscurely clawed, 12-15 mm. long and broad, lower sepals oblong, obtuse, 9-12 mm. long. *Nectaries* extinguisher-shaped glabrous, claw 5-6 mm. long, leaning forward in the upper part; hood short, wide, very obtuse, top slightly gibbous on the back, honey-gland occupying the whole top or the gibbosity. *Filaments* glabrous or very sparingly hairy, winged; wings gradually or abruptly attenuated. *Carpels* 5, glabrous, rarely or sparingly hairy on the back, conniving abruptly, contracted into the short style, back convex. *Follicles* oblong, truncate, 10-16 mm. long, contiguous or with slightly divergent tips, glabrous. *Seeds* brown obovoid to obpyramidal, 3.5 mm. long, equally 3-winged, wings thin, faces smooth.

Properties and uses.—The root contains, according to Professor Dunstan, aconitine, but in very small proportions. It seems that it is sometimes used in Northern India as a substitute for the imported tuber of *Aconitum Napellus* (Wall).

Aconitum Chasmanthum, Stapf.—This was for sometime supposed to be the European *Aconitum Napellus*, but is now known to be a distinct species.

The plant is known as 'Mohri.'

The alkaloid which has been obtained from the plant proves to be exceptionally interesting, since it represents a compound intermediate between the aconitine of the European *Aconitum Napellus* and the pseudo-aconitine of the Indian *Aconitum ferox*. This alkaloid is named *indaconitine*.

Properties.—Indaconitine is soluble in acetone, chloroform, alcohol, or ether, but practically insoluble in light petroleum or water.

By the addition of light petroleum to a solution of the base in alcohol, chloroform, or ether, well defined crystals may be readily obtained.

A peculiar property of indaconitine which sharply distinguishes it from aconitine is its capability of crystallising in several forms from the same solvent. The crystalline form appears to depend on the purity of the substance and on the strength of the solution. By rapid crystallisation, the base is deposited from ether in rosettes of needles, but if allowed to crystallise slowly, or if the substance is not quite pure, it is obtained as transparent, hexagonal prisms or large, irregular masses. If a somewhat concentrated

solution is decanted from a flask, the indaconitine crystallises on the sides, either in a characteristic fern-like form or in thin, circular layers of silky needles.

Indaconitine crystallises uncombined with its solvent.

The melting point of indaconitine, if immersed in the bath at 150° and the temperature slowly raised, is 202-203°. Crystallographically, indaconitine very closely resembles aconitine, and on further investigation may prove to be isomorphous.

Composition.— $C_{34} H_{47} O_{10} N$, requires C=64.86; H=7.47, and N=2.22 per cent.

Physiological action.—This differs in degree only, and not in kind, from that of aconitine and pseudo-aconitine. As in the case of other "aconitines," the toxic action of indaconitine is virtually abolished by the removal of the acetyl group, which occurs in the formation of indbenzaconine, an alkaloid which is scarcely poisonous.

19. *A. rotundifolium*, Ver. and Kir.

Syn.—*A. napellus*, var. *multifidum*, Duthie.

A. napellus, var. *rotundifolium*. *Hk. f. and Th.*

Habitat.—Alpine zone of Turkistan to the North-Western Himalaya, and the Safed Koh of Indo-Afghan frontier.

Roots.—Biennial, paired, tuberous; daughter-tuber short, or long, conic or subcylindric, 1—2.5 cm. long, 6-8 mm. thick, bearing long fine root—fibres breaking off easily; bark very thin, whitish to brown, smooth, fracture pure white, farinaceous; taste slightly bitter, almost indifferent; cambium discontinuous, forming 4-5 isolated, very slender cylindric strands arranged in a ring; mother-tuber more or less shrunk, wrinkled, dark brown to almost black, brownish internally. *Stem* erect or ascending from a short (1.5 cm.) hypogæous base, simple, 15-40 cm. high, terete, slender, crispo-pubescent in upper part, glabrous below. *Leaves* mostly basal, 4-5 rarely 8, gathered in a loose rosette above the hypogæous part of the stem, coëtanous with the flowers, somewhat fleshy, glabrous or scantily pubescent on long (4-13 cm.) petioles which are dilated and more or less sheathing at the base; 1-2 or rarely more, higher up on the stem or very short petioles; lower blade, orbicular-cordate or almost reniform in outline, with a narrow sinus (0.7-2 cm. deep), 1-3.5 cm. high

from the sinus to the tip, 2-6 cm. across, 5-7-palmati-partite to $\frac{4}{5}$ - $\frac{7}{8}$ in the inner, to $\frac{2}{3}$ or less in the outer incisions, divisions broadly ovate-cuneate, 3- or (the outermost) 2-lobed to or beyond the middle, lobes narrow, sparingly crenate or inciso-crenate, crenae subobtusate, callosa-apiculate; cauline blades similar to the lower, but smaller, less divided, with narrower and longer lobes and more pubescent. *Inflorescence* a short (up to 8-9 cm.), few-flowered, usually loose raceme, or with a few slender, few-flowered, additional branches from the uppermost of the much reduced leaves, crispo-pubescent to tomentose; lowest bracts 5-3-partite, very narrow divisions, or like the upper entire, linear, as long as or longer than the pedicels, uppermost much reduced or suppressed; bracteoles, if present, minute; pedicels slender, lowest up to 2 cm. long, upper much shorter, erect in the mature state, more or less adpressed to the rhachis. *Sepals* pale or purplish blue or white or variegated, with saturated veins, more or less pubescent, overlapping at the base only in the fully open flowers; uppermost navicular, more or less beaked, obliquely erect, 12-20 mm. high, 15-25 mm. long (from the beak to the base), 4-7 mm. broad, obliquely clawed; lateral sepals oblique, broadly obovate or suborbicular, about 15 mm. long, 10-13 mm. broad; not or obscurely clawed, lower sepals deflexed, elliptic-oblong, or elliptic-obtusate, about 8 mm. long. *Nectaries* glabrous, extinguisher-shaped; claw very slender, 12-15 mm. long, leaning forward in the upper part, hood horizontal, or more or less deflexed, saccate, very obscure, top often widened and gibbous in front, lip 2-lobed, lobes often narrow and rather long. *Filaments* glabrous, very rarely with a few minute hairs, winged to the middle, wings gradually alternated or running into minute teeth. *Carpels* usually 5 (4 or 6), contiguous, oblong, abruptly contracted into the style, softly villous. *Follicles* contiguous or almost so, oblong, truncate at the top, 9-13 mm. long, softly hairy. *Seeds* brown, obpyramidal, 3-angled, obliquely truncate at the top, 2.5-3 mm. long, angles unequally winged, wings hollow, faces smooth.

General Properties:—On the authority of Col. Monro, the roots of the Alpine form, it appears, are eaten by the hillmen of Kanawar as a pleasant tonic, under the name of *Atees* (Stapf).

20. *A. deinorrhizum*, Stapf. sp. nov.

Fig. :—Stapf. Annals Roy. Bot. Gard. Calcutta, Vol. X, pt. ii, t 103.

Habitat :—Alpine Himalaya of Bashahr.

Vernacular name—*mohra*, *maura* bikh.

Roots :—Biennial, tuberous, paired ; daughter-tuber conical, rather elongated, up to 6.5 cm. long, and at the upper end up to 18 mm. thick, with very few filiform root-fibres, brown externally, fracture scarcely farinaceous, whitish, taste indifferent, followed by a strong tingling sensation, cambium discontinuous, broken into strands, arranged in a ring, the smaller circular in cross-section, the larger tangentially flattened ; mother-tuber similar, more or less shrunk, wrinkled, with long filiform root-fibres. *Innovation-bud* a very low, broad, obtuse cone ; scales very broad with a clasping base, decaying after sprouting. *Stem* several feet high, erect, straight, simple, terete, sparingly and finely crispo-pubescent in the upper part, otherwise glabrous, shining, or in young plants sparingly pubescent all along. *Leaves* up to 10 or 12, scattered, lower usually decayed at the time of flowering, the upper 6-8 rather distant, sparingly hairy when young, especially towards the margins and on the nerves below, soon glabrescent ; petioles slender, mostly 5-7 cm. long, dilated at the base ; blade reniform or ovate-reniform in outline, with a very wide sinus or an almost truncate base, 5-pedati-partite almost to the base (to $\frac{15}{18}$ - $\frac{19}{20}$ in the inner, to $\frac{3}{4}$ - $\frac{7}{8}$ in the outer, incisions), inner divisions subequal or intermediate, distinctly longer, rhombic from a cuneate base, up to 8 cm. (or the intermediate to 10 cm. long), 5-6.5 cm. broad, 3-lobed to the middle, intermediate lobe much longer than the lateral, lobes deeply laciniate, laciniae linear or broad-lanceolate, entire or sparingly inciso-dentate, shortly acute or subobtuse, outer divisions asymmetric, usually to or beyond the middle, otherwise similar to the inner, but smaller. *Inflorescence* straight, racemose, simple or sometimes with an additional branchlet from near its base, 30-40 cm. long, narrow, not very dense, greyish, crispo-pubescent ; lowest bracts similar to the preceding leaves, or like

the rest much reduced, coarsely and sparingly dentate, the uppermost very small; pedicels erect, slender, lower up to 6.5 cm. long, upper much shorter; bracteoles linear, up to 4 mm. long, or on the lower pedicels broader and sparingly dentate. *Sepals* blue, crispo-puberulous; uppermost helmet-shaped, helmet more or less oblique, depressed, 15-20 mm. high, 17-22 mm. from the tip to the base, about 7 mm. wide (in profile), slightly concave towards the base in front and produced into a short beak and broadly clawed; lateral oblique, sub-orbicular, scarcely unguiculate, ciliate, 14-18 mm. long; lower oblong, 10 mm. long, obtuse, deflexed. *Nectaries* hispidulous all over; claw almost straight, 12-13 mm. long; hood leaning forward, gibbous near the top on the back, 5 mm. long, lip short, broad, emarginate, reflexed. *Filaments* hairy in the upper part, 8-10 mm. long, winged beyond the middle, wings abruptly contracted. *Carpels* 3, oblong, conniving in the flower, then sub-divaricate, adpressedly greyish-pubescent, contracted into the rather long style. *Follicles* unknown. *Seeds* obconic, 3 mm. long, terete with numerous small, short transverse lamellæ.

Properties and uses.—Watt quotes in Agric. Ledg., G. G. Minniken as saying that in Bashahr the poisonous aconites are collectively called Mohra. The poisonous principle of this aconite is pseudo-aconite.

21. *A. Balfourii*, Stapf, sp. nov.

Vernacular names:—*Gobriya* (Darma); *Gobari* (West Nepal); *Banwa* (British Garhwal).

Habitat:—Subalpine and Alpine Himalaya, from British Garhwal to Nepal.

Roots biennial, paired or ternate, tuberous; daughter-tubers sometimes paired or divided from the base, conic or elongate, conico-cylindric, 3-7 cm. long, 1-2 cm. thick with a few root-fibres which are either slender-filiform or conspicuously thickened (up to 5 mm. diam.) at the base, externally greyish-brown, fracture white, almost horny, taste rather indifferent, followed by a tingling sensation; cambium discontinuous, broken up into strands arranged in a ring, the smaller circular in transverse section,

the larger tangentially flattened to horse-shoe-shaped; mother-tubers, with often numerous root-fibres much shrunk, grooved and wrinkled with conical stumps (root-fibre bases), collapsed. *Innovation-bud* a much depressed, broad, obtuse cone or hemisphere, scales broad with a clasping base usually decaying after sprouting. *Stem* erect, several feet high, straight, robust, simple, terete, delicately pubescent in the upper part, otherwise usually quite glabrous. *Leaves* scattered, 6-10, the lowest decayed at the time of flowering, intermediate and upper leaves rather distant, pubescent when young, at length glabrous, with the exception of the nerves below, lower petioles up to 7.5 cm. long, intermediate and upper much shorter, somewhat dilated at the base; blades dark-green above, paler below, orbicular or ovate-cordate or sub-reniform, with narrow or wide sinus, 1-2 cm. deep, 7-9 cm. from the sinus to the tip, 10-12 cm. across, 3-partite to $\frac{7}{8}$, intermediate division rhomboid-ovate from a broad cuneate base, 3-lobed to the middle, middle lobe much larger than the lateral, lateral divisions trapezoid, very unequally 2-lobed to the middle, all the lobes coarsely inciso-crenate or dentate, crenæ, spiculate or acute. *Inflorescence* straight, racemose narrow, up to 30 cm. long, many-flowered, rather dense, yellowish-tomentellous, and slightly viscous; lowest bracts resembling the preceding leaves, following ovate or lanceolate, inciso-dentate, or dentate, uppermost often entire; pedicels erect or the lower ascending, lowest up to 5 cm., upper 2.5 cm. long; bracteoles, if any, inciso-dentate, or dentate, small. *Sepals* blue, pubescent; uppermost helmet-shaped, helmet oblique, sub-semi-orbicular in profile, slightly concave in front and shortly beaked, about 20 mm. high and 20 mm. from tip to base, 10-13 mm. wide, very shortly and broadly clawed, lateral sepals sub-oblique or orbicular or slightly broader than long, up to 16 mm. long, obscurely clawed; lower sepals elliptic or broad-oblong, obtuse, 12-14 mm. long. *Nectaries* glabrous, claw erect, or slightly curved, 12-13 mm. long; hood leaning forward, rather crenulate. *Filaments* hispidulous in the upper part or almost glabrous, 6 mm. long, broadly winged to beyond the middle, wings gradually or abruptly running out. *Carpels* 5, oblong, yellowish-tomentose, conniving in the flower, then slightly divergent. *Follicles* oblong, slightly divergent

above, otherwise contiguous, loosely hairy, or glabrate, 12 mm. long, 4-5 mm. broad. *Seeds* obpyramidal, trigonous, 3-3.5 mm. long, dark-brown, broadly winged along the raphe, faces with narrow transverse lamellæ giving out towards the back.

Properties and uses :—Gobriya is quoted by Duthie as the name of one of the nine poisonous aconites of the Râlam Valley. A sample of tubers from Dudatoli was examined by Prof. Dunstan, with the result that the daughter-tubers contained nearly 1 per cent and the mother-tubers 0.5 per cent of pseudo-aconitine.

22. *A Falconeri*, Stapf., *sp. nov.*

Vernacular names :—Bis, Bikh, Meetha-tellia, (Royle) in an incomplete manuscript catalogue (of Himalayan plants) at Kew.

Habitat :—Subalpine and Alpine Zone of the Himalaya of Garhwal.

Roots biennial, paired, tuberous, daughter-tuber conic to cylindric from a broad, truncate base, up to 8 cm. long, to 2 cm. thick, entire or divided, bearing more or less numerous filiform fibrous root-fibres, externally brown, fracture white, slightly farinaceous or horny, taste somewhat bitter, followed by a strong burning and tingling sensation, cambium continuous, forming in transverse section a slightly sinuous ring; mother-tuber similar, much shrunk and wrinkled. *Innovation-bud* very short and broad, conic, bud-scales very short, broad and clasping, soon decaying after sprouting. *Stem* erect, simple, up to 1 m. high, moderately stout, finely pubescent or subglabrous in the upper part, quite glabrous below. *Leaves* scattered, 10 or more, if many, the upper sometimes rather crowded, the intermediate usually very distant, the lowest decayed at the time of flowering; petioles slender, lowest up to 12 cm. long, upper much shorter, uppermost very short; blades rather thin, very sparingly and finely pubescent or glabrous, with the exception of the nerves at the base below, lower and intermediate rotundate-cordate to reniform in outline, with a very wide and open sinus, 1-3 cm. deep, 6-10 cm. high, from the sinus to the tip, 12-15 cm. across, 5—sub-pedati-partite to

$\frac{7}{8}$ or more in the inner, to $\frac{3}{4}$ or more in the outer incisions, inner divisions rhomboid-cuneate, 3-lobed to the middle, with the inner lobe elongated and pinnati-laciniate, outer divisions much smaller, trapezoid, 2-lobed, all the lobes and laciniae broadly inciso-dentate, teeth usually triangular, upper blades very similar, but smaller and less deeply divided or 3-partite, with intermediate division much longer than lateral. *Inflorescence* an erect stiff, usually dense raceme, about 15-20 cm. long, rarely lax and with slender few-flowered ascending additional branches from below, finely adpressedly pubescent or rarely with short spreading hairs; axis rather slender, lowest bracts 3-partite, upper ovate to deltoid, all acutely and coarsely dentate; bracteoles usually present, resembling the upper bracts, but much smaller; pedicels slender, erect, often almost adpressed to the axis, lowest up to 4 cm. long, the upper much shorter. *Sepals* blue, with very dark tips (in the dry state), pubescent; uppermost helmet-shaped, helmet obliquely semi-orbicular in profile, very shortly beaked, 16-22 mm. high, 18-22 mm. long, from the tip to the base, 8-9 mm. wide; lateral sepals oblique, suborbicular or ovate-orbicular, 14-18 mm. long, lower sepals oblong-elliptic, obtuse 8-10 mm. long. *Nectaries* extinguisher-shaped, claw erect, 13-15 mm. long, minutely hispid, hood leaning forwards or almost horizontal, slightly constricted or obscurely gibbous on the back, close to the top, lip spatulate, broad, crenulate. *Carpels* 5, obliquely oblong, conniving in the flower, soon slightly divergent, gradually passing into rather long style, quite glabrous and black when dry, or sometimes more or less very minutely silky-pubescent. *Follicles* erect and contiguous or slightly diverging upwards, oblong rounded at the top, 14-18 mm. long, 4-5 mm. broad, glabrous, faintly reticulate. *Seeds* brown, obconic, 3-4 mm. long, winged (often broadly) along the rraphe, with undulate, hyaline, rather wide and distant transverse lamellae.

Variety, *Latilobium*, Stapf.

Roots up to 12 cm. long, and 2.5 cm. thick, with few fibres. *Upper leaf-blades* 3-partite to $\frac{5}{8}$; up to 6.5 cm. high, 10 cm.

across, divisions broadly deltoid or the outer trapezoid up to 4.5 cm. broad, shortly 3-or (the outer) 2-lobed, lobes coarsely crenate or dentate. Inflorescence tomentose, with spreading hairs. *Carpels* quite glabrous.

Properties and uses :—Evidently poisonous.

23. *A. spicatum*, Stapf., *sp. nov.*

Ann. Roy. Bot. Gard. Calc., Vol. X., pp. 165-166.

Vernacular names :—*Bikh*, *Kalo Bikhoma Donghi* ; *Guiong Mot* and *Shodduk Mot*.

Habitat :—Alpine zone of the Himalaya of Sikkim and Chumbi.

Roots biennial, paired, tuberous, daughter-tuber conic or conic-oblong, often rather elongated, 10-20 cm. long, 1.8-3 cm. thick, simple or sometimes deeply divided, with filiform root-fibres, the bases of which are sometimes abruptly thickened and persist as conical ovoid stumps, brown or blackish externally, fracture horny, yellowish or brown in the dry state, taste slightly sweetish bitter, followed by a tingling sensation ; cambium continuous, forming in cross-section a more or less sinuous ring ; mother-tuber similar, shrunk and wrinkled. *Innovation-bud* a very broad, much depressed cone, with broad clasping scales, decaying soon after sprouting. *Stem* erect, up to 1.5 m. high, straight or slightly flexuous above, simple terete or sometimes slightly angular, robust, sometimes as much as 3 cm. in diam., adpressedly greyish-pubescent, with deflexed hairs, glabrescent or quite glabrous in the lower part, brown or almost black when dry. *Lowest leaves* 5-8, decayed at the time of flowering, their scars rather distant ; intermediate and upper leaves as many as 12, approximate or congested, petioled ; petioles 2.5-7.5 cm. long, dilated at the base, blades somewhat fleshy, more or less finely pubescent, or at length glabrous above orbicular-cordate or reniform or broadly ovate (particularly the upper), with a usually shallow sinus, 3-partite to $\frac{4}{5}$ - $\frac{6}{7}$ or the upper to $\frac{2}{3}$, intermediate division rhomboid or ovate from a linear cuneate base, sometimes acuminate, 5-10

cm. long, 3.75 cm. broad, lateral divisions separated by a narrow sinus from the intermediate, broad-trapezoid, 2.5-7.5 cm. long, very unequally 2-3-partite to $\frac{2}{3}$ - $\frac{5}{8}$, all the divisions much inciso-dentate or laciniate, with acute dentate laciniae. *Inflorescence* stiff, racemose or often paniced, narrow, many-flowered, dense, rarely loose and subflexuous, more or less tomentose, with spreading or deflexed hairs; lower bracts like the preceding leaves, but smaller, more elongate and less dissected, longer than the pedicels, intermediate and upper lanceolate or oblong, sparingly dentate or entire, often over 2 cm. long, pedicels erect, rather stout, lower over 2.5 cm. long, upper much shorter; bracteoles, if any, herbaceous, rather broad and dentate, or narrow and entire to very narrow. *Sepals* of a saturated blue, more rarely pale or purplish blue, more or less pubescent to almost tomentose; uppermost helmet-shaped, helmet erect or slightly oblique, depressed, semi-orbicular in profile, almost equally curved in front and on the back, 20-24 mm. high, 20-24 mm. from the tip to the base, 12-15 mm. wide, produced into a very short beak, claw very short and broad; lateral sepals oblique, suborbicular, 12-18 mm. long, obscurely clawed; lower horizontal or deflexed, oblong, obtuse, 8-12 mm. long. *Nectaries* glabrous or scantily hispidulous, claw slightly curved or straight, 10-12, rarely 14 mm. long, hood much leaning forward or sub-horizontal, dorsally gibbous or almost spurred on the top, 6-8 mm. long, lip usually short, broad emarginate. *Filaments* glabrous or sparingly hispidulous in upper part, 7-8 mm. long, winged to or beyond the middle, wings gradually running out or suddenly contracted into small teeth. *Carpels* 5, oblong or ovoid, contracted into the slightly shorter style, densely tomentose. *Follicles* 5, oblong, somewhat turgid, contiguous, about 10 mm. long, 4.45 mm. broad, hairy. *Seeds* obpyramidal, about 4 mm. long, winged along the raphe, with undulate hyaline transverse lamellae on the faces.

Properties and uses :—This species is the principal source of the *Bikh* or *Bish* of the Calcutta market. An account of the mode of collecting the root in Sikkim may be found in Kanny Lal Dey's work on the 'Indigenous Drugs of India, (1896), where it

is, however, introduced erroneously as *A. Napellus*. The poisonous principle is pseudoaconitine. The amount of pseudoaconitine found in the tubers of this species may, according to Prof. Dunstan, reach as much as 0.50 per cent (Stapf).

24. *A. laciniatum*, Stapf. *sp. nov.*

Vernacular name :—Kalo Bikhmo.

Habitat :—Subalpine and Alpine Himalaya of Sikkim and adjoining Tibet.

Roots biennial, tuberous, paired; daughter-tuber conic-oblong, often rather drawn out into a slender point, 3.5-6 cm. long, about 1.5-2 cm. thick, simple or divided, with filiform root-fibres, which are generally not much thickened at the base, brown externally, fracture whitish or pale brownish, almost horny, taste indifferent or very slightly bitterish, followed by a tingling sensation; cambium continuous, forming a sinuous ring in cross-section; mother-tuber similar, usually much shrunk and thinner. *Innovation-bud* an acute cone, up to 1 cm. high, outermost scales are very short, clasping, soon decaying after sprouting. *Stem* erect, stiff or flexuous, 6 to 9 dm. high, simple terete, slender to rather robust, finely pubescent in the upper part, with adpressed reversed hairs, otherwise glabrescent or quite glabrous and shining, drying usually chestnut-brown. *Leaves* scattered; basal 5-6, rarely 8, decayed at the time of flowering, rather distant; intermediate and upper leaves up to 10, approximate or congested, petioled, petioles rather slender, 2.5-7.5 cm. long; blades somewhat fleshy, finely pubescent or almost glabrous, reniform, rarely cordate-orbicular in outline, with an usually wide and shallow sinus, 4-7, rarely to 10 cm., from the sinus to the tip, 7-12 cm. across, 5-pedati-partite almost to the base in the inner, to $\frac{3}{4}$ - $\frac{5}{8}$ in the outer incisions, inner divisions sub-equal, rhomboid from a narrow cuneate base up to 5 cm. wide, 3-lobed to the middle, lobes narrow, inciso-dentate or laciniate, laciniae lanceolate or linear, acute or acuminate, outermost divisions asymmetric, mostly unequally 2-lobed, otherwise similar to the inner, but smaller. *Inflorescence* racemose or usually loosely paniculate, few to many-

flowered, finely greyish pubescent, with adpressed curved hairs; lower bracts similar to the preceding leaves, but smaller and less dissected, intermediate and upper lanceolate, sparingly laciniate or the uppermost entire and very narrow; pedicels ascending, slender, lowest 3.5-5 (rarely 7.5) cm. long, upper much shorter; bracteoles herbaceous, resembling the upper bracts. *Sepals* saturated red-purple or dark-red, finely pubescent; uppermost helmet-shaped, helmet erect or sub-erect, equally curved in front and on the back, or slightly concave in front, produced into a short lip or beak, about 20 mm. high and 20 mm. from the tip to the base, 9-13 mm. wide, claw broad, short; lateral sepals oblique, sub-orbicular, ciliate, 14-16 mm. long, broadly and obscurely clawed; lower deflexed or sub-horizontal, oblong, obtuse, 12-14 mm. long. *Nectaries* hispidulous, at least below; claw slightly curved, about 12 mm. long; hood sub-erect or slightly leaning forward, 6 mm. long, gibbous or almost spurred on the back, close to the apex, lip short or elongate, rather broad, 2-lobed. *Filaments* hispidulous in the upper part, 7 mm. long, winged up to or beyond the middle, wings gradually or abruptly running out. *Carpels* 3, rarely 4 or 5, conniving in the flower, oblong, attenuate into a slender, finely curved style, densely and adpressedly pubescent. *Follicles* at first divergent, then conniving, contiguous, linear-oblong, more or less convex on the back, 18-25 mm. long, 5-6 mm. wide, finely pubescent. *Seeds* obpyramidal, 3-gonous, 3 mm. long, brown, broadly winged along the raphe, with transverse, undulate, hyaline lamellæ.

Properties and uses :—According to Rogers, it forms, together with *Bikh* (*A. spicatum*) the article known as "Nepal Aconite."

25. *A. lethale*, Griff.

Syn. :—*A. palmatum*, Don. H. F. BR. I., 1. 28.

Vernacular name :—Unknown.

Habitat :—Higher parts of Mishmi Mountains.

Roots (according to Griffith) fusiform, whitish or brown, bearing root-fibres. *Stem* branched, flexuous, slender, terete,

glabrous on the uppermost part, pubescent from minute adpressed reversed hairs. *Basal leaves* unknown; intermediate and upper leaves scattered, petioled; petioles slender, up to 5 cm. long; blades shining, bright green above, pale below, glabrous or scantily pubescent in the nerves below, cordate, rotundate in outline, with a wide sinus or reniform, 3-partite to $\frac{5}{8}$ (or the small leaves of the branches 5-lobed to the middle), intermediate divisions narrow, obovate-cuneate, almost 5 cm. long, up to 1.8 cm. broad, lateral divisions trapezoid, up to 3.5 cm. long, unequally divaricate-2-lobed to the middle, all coarsely dentate, teeth apiculate. *Inflorescence* slightly pubescent; panicle few-flowered, says Hooker. *Flowers* large, greenish-blue (Hooker); bracts foliaceous 3-lobed, lobes sparingly dentate; pedicels long, more or less reduced, near the flower. *Sepals* slightly pubescent, uppermost helmet-shaped, helmet semi-orbicular elliptic in profile, 18-20 mm. high, 18-20 mm. from tip to base, 12 mm. broad, lateral oblique, orbicular-ovate, shortly and broadly clawed up to 16 mm. long, 10-12 mm. broad; lower deflexed, broad elliptic sub-obtuse, up to 16 mm. long. *Nectaries* glabrous, claw erect, oblong, shortly spurred from the top, 6 mm. long, lip broad, 2-lobed. *Filaments* glabrous, 8-9 mm. long, winged to or beyond the middle, wings gradually or suddenly contracted. *Carpels* 5, obliquely oblong, sparingly pubescent (Stapf). *Follicles* 1-1½ in. long, glabrous (Hooker). *Testa* plaited (Hooker).

Properties and uses:—This is, according to Griffith, the source of the celebrated *Bhi* or *Bis* poison of the Mishmis.

The pharmacology of Indaconitine and Bikhaconitine.

Indaconitine, an alkaloid obtained from *Aconitum Chasmanthum*, yields, on partial hydrolysis, acetic acid and benzoylpseudoaconine; the latter substance splits up on further hydrolysis into benzoic acid and pseudoaconine.

Bikhaconitine, from *A. Spicatum* (*A. ferox*, var. *Spicatum*), yields, under the same conditions, acetic acid, veratric acid, and a pseudoaconine, identical with that obtained from indaconitine.

As regards physiological action, these two alkaloids show a qualitative agreement with aconitine, japaconitine, and pseudoaconitine.

Bikhaconitine has a more powerful toxic action on cats and rabbits than indaconitine; of the alkaloids so far examined, aconitine and indaconitine are about equally poisonous, japaconitine is rather more active than these, but not quite so toxic as bikhaconitine, whilst pseudoaconitine is the most active of the series. Bikhaconitine and indaconitine are equally toxic towards frogs. The greater toxic action of bikhaconitine towards warm-blooded animals is due to its more powerful depressing effect on the respiration; the respiratory activity of frogs is also diminished to a greater extent by the former alkaloid. The relative activity of the two alkaloids in abolishing the power possessed by nerve-muscle preparations of responding to stimuli, was investigated by immersing the tissues in dilute solutions of the hydrobromides, and it was found that in this respect indaconitine is slightly more active than bikhaconitine.

The pseudoaconines obtained from the two alkaloids appear to be identical in physiological action, and behave in all respects like the aconine and aconitine.

(J. Theodore Cash and Wydnham R. Dunstan, *Proceedings Roy. Soc.*, 1905). J. Ch. S., Vol X C, pt II., p. 41.

26. *Actæa spicata*. Linn. H.F.BR.I., I. 29.

Habitat:—Temperate Himalaya 6,000—10,000 ft. Simla, in Narkunda forest; from Bhutan to Hazara. Shady ravines of Jaunsar and Tehri-Garhwal.

Part used:—The root.

A perennial, more or less pubescent herb, *Stems* 2-3 ft., erect, usually branched. *Leaves* 6-12 in., alternate pinnately compound, the pinnules often with 3 leaflets; leaflets ovate-lanceolate, pointed, often lobed, deeply and sharply toothed. *Flowers* regular, scarcely $\frac{1}{4}$ in. diam., white, crowded in short terminal racemes lengthening in fruit. *Sepals* 4, petal-like,

concave, soon falling off. *Petals* 4, shorter than the sepals, clawed. *Stamens* numerous, longer than the sepals, anthers small. Ovary solitary, many-ovuled, stigma sessile, flat. *Fruit* a black ovoid, glabrous berry containing numerous small seeds. (Collett). The Baneberry of Britain. Hooker, f. and Thomson say that the berry is black in the European and Himalayan forms, white and red in the American.

Uses:—Stewart remarks regarding this plant:—"I have found no trace of its being used or dreaded" by the hill people on the Panjab Himalaya. It would be interesting to know whether this is correct; for it is curious that so useful a plant should have escaped the notice of the natives of India. Canadian doctors administer the root in snake-bite; and it is said to be attended with much success in the treatment of nervous diseases, rheumatic fever, chorea and lumbago. The berries were formerly used internally for asthma and scrofula, and externally for skin complaints. Baneberry Root is largely exported into Europe and used to adulterate the root of *Helleborus niger*. Mr. FREDERICK STEARNS describes the root as violently purgative. (WATT).

27. *Cimicifuga foetida*, Linn. H.F.BR.I., I. 30.

From Latin *cimex*, a bug; *fugare* to drive away.

Vern:—Jiunti (Pb.).

Habitat:—Temperate Himalaya, from Bhotan to Gores and Kashmir; altitude 7-12,000 ft. Patarnala forest, Simla.

A perennial, more or less pubescent herb. *Stems* 3-6 ft., erect, leafy, branched. *Leaves* 6-18 in., pinnately compound; leaflets 1-3 in., rarely more, ovate or lanceolate, deeply and sharply toothed, terminal leaflet 3-lobed. *Flowers* nearly regular, hardly $\frac{1}{4}$ in. diam., white, crowded in short or long racemes, solitary in the axils of the upper leaves, and combined in a terminal, sometimes large and spreading panicle. Sepals and petals 5-7 (no clear distinction between them), imbricate, ovate, concave; one or two of the inner ones deeply 2-lobed, the tips white, broad, notched. *Stamens* numerous, ultimately longer

than the sepals. Ovaries 2-5, rarely more, many-ovuled, style short, stigma pointed. Follicles $\frac{1}{2}$ in. long, flat, tipped with the persistent style. Seeds 6-8 (Collett).

Part used:—The root.

Uses:—The root is said to be poisonous. In Siberia, it is used to drive away bugs and fleas. "Under the name of a nearly allied plant (*Actæa spicata*), I have already referred to this plant, and I have done so chiefly with the view of attracting attention to these useful, but apparently neglected plants." (WATT).

Garrod in his *Materia Medica*, calls *Cimicifuga racemosa*, Linn., the Black Snake Root, and remarks that it is a remedy much used in America. He gives the dose of the tincture as 30 to 40 minims. He remarks:—"Its use is said to have been attended with much success in rheumatic fever, in chorea, and in lumbago, and in some forms of puerperal hypochondriasis.

There seems every reason to expect that the Indian species, which differs from *C. racemosa* only very slightly, will be found to possess all its medicinal virtues. *C. racemosa* is chiefly prescribed in the form of tincture and employed in rheumatic affections, dropsy, the early stage of phthisis, and chronic bronchial diseases. Externally, a strong tincture has recently been used to reduce inflammations. See (*Year-Book of Pharmacy*, 1872). The root contains a resinous active principle which has been termed Cimicifugin or Macrotoxin. In its action this drug resembles hellibore on the one hand, and colchicum on the other. It is most useful in acute rheumatism, and a powder of the root is perhaps the best mode in which to give the drug, in doses of 20 to 30 grains. (*Royle's Mat. Med.* by Harley.)

A poultice prepared from the fresh leaves is used here, and said to be very useful in rheumatic affection of joints (Surgn. Meadows, Barisal).

28. *Paeonia Emodi*, Wall. H.F.BR.I., I. 30.

Syn:—*Paeonia officinalis*, Hf. and T.

Vern.:—Ud-sálap (H.); Bhuma-madiya, yet ghás (Bhut.); Mamekh (Pb.); Chandra, (the plant); Sájumiya (the young edible shoot) N-W. P.

Habitat:—West Temperate Himalaya, from Kumaon to Hazara. 5,000 to 10,000. In the upper Tons valley.

A glabrous perennial herb. *Stems* 1-2 ft., leafy, erect. *Leaves* alternate, 6-12 in. long; leaflets 3, usually 3-parted, segments lanceolate, pointed, entire. *Flowers* few, showy 3-4 in. across, long-stalked, usually solitary in the axils of the upper leaves. Buds globose. Sepals 5, orbicular, concave, green, persistent the outer ones ending in a leaf-like point. Petals 5-10, broadly ovate, concave, red or white. Stamens many. *Ovaries* 1-3, densely hairy, many-ovuled, seated on a fleshy disk; style short, broad, recurved. Follicles ovoid, 1 in. *Seeds* few, large, (Collett).

Dr. Dymock observes:—"The tubers are of the *female* *Pæony* of Dioscorides. It seems therefore that the male plant is distinct, and is called *P. Corallina*; the female is called *P. Officinalis*. (*Vide* Pharmac. Ind. Vol. I., P. 17). The flowers are often pinkish.

In the Botanical Magazine for July 1st, 1868 Dr. Hooker writes:—

"In the 'Flora Indica' Dr. Thomson and I referred the Himalayan Peonies to forms of *P. Officinalis*,—a conclusion little acceptable to some botanists, and not at all to gardeners. On reviewing the subject *à propos* of the present plant, I see no reason to alter my opinion that, as compared with the species of many other genera, the Himalayan ones may well be referred to forms or varieties of the European; but as they differ greatly in habit, colour, and those qualities that render them worthy of cultivation, as well as in some other points of a little more moment. I here keep one at any rate distinct. This is the *P. Emodi* of Wallich, a common temperate Himalayan plant from Kumaon to Kashmir which is easily recognised by its slender habit, white, subpanicle flowers, and solitary tomentose carpel; in this respect alone, of a solitary tomentose carpel, it differs from *P. Albiflora*, Willd. of Siberia; and in the tomentose carpel alone from a Kashmir one-carpelled plant, hitherto not distinguished from this, and which, therefore, differs from *P. albiflora* in the solitary carpel alone."

"* * Dr. More F.L.S. says of it that it is the most distinct of all the herbaceous Peonies, several of the flowers expanding together on the same stem, and being always monogynous. It is more tender than any other herbaceous species, and appears above ground a month earlier than these do."

Parts used :—The tubers ; flowers ; seeds and root.

Uses :—The tubers of this plant are highly esteemed as a medicine for uterine diseases, colic, bilious obstructions, dropsy, epilepsy, convulsions and hysteria. *Ud-sālap* is generally given to children as a blood-purifier. It was a common belief in ancient times, and it is so even now among the peasantry of Europe, that pæony root, if worn by children round their necks, has the power of preventing epileptic attacks. If taken in full doses (60 grains), the drug produces headache, noise in the ears, confused vision and vomiting. (DYMCK.) The infusion of the dried flowers is highly valued as a remedy for diarrhœa. Seeds are emetic and cathartic. (WATT).

According to Dr. BELLEW, the root is in Booner, given to cattle to render them prolific ; and in combination with other drugs, as the bruised leaves of *Melia*, is a favourite remedy for bruises, sprains, etc.

N. O. DILLENIACEÆ.

29. *Dillenia indica*, Linn. H.F.BR.I., I. 36 ; ROXB. 451.

Sanskrit :—Bhavya.

Vern. :—Chálta, (Hind.) ; Cháltá, hargesa (Beng.) ; Korkot (Santal) ; Chilta (Monghyr) ; Panpui (Garo) ; Chalita otengah, (Assam) ; Rai, oao (Uriya) ; Ramphal (Nepal) ; Phamsikol (Lepcha) ; Thapru, chauralesia (Mag.) ; Mothe karamala, mothá karmel, karambel (Bomb.) ; Motá karmal, karmbel (Mar.) ; Uva (Tam.) ; Uva, pedda, kalinga (kalinga, ELLIOT) (Tel.) ; Bettakanagala, kaddkanagula (Kan.) ; Syalita (Malay.) ; Honda-para, Wampara (Sinhalese).

Habitat :—Tropical forests in the Western Peninsula, Behar and Ceylon, and the Himalaya, from Nepal to Assam. Commonly cultivated at Dehra and Saharanpur. Eastern Peninsula, from Sylhet to Singapore. Malay Peninsula and the Islands.

A very handsome tree with fine foliage ; moderate-sized, round-headed. Bark cinnamon—brown. *Leaves* closely placed,

very large, 10-12 in long, oblong-lanceolate, acute, sharply serrate, glabrous above, finely pubescent on veins beneath; lateral veins numerous, strong; *petioles* $1\frac{1}{2}$ in. long, stout, deeply channelled above, pulvinate at base. *Flowers* very large, 6-7 in. diam, on stout subterminal pedicels. Sepals very fleshy. *Petals* white, sometimes pale-azure orbicular with a broad base. *Stamens* persistent, yellow. *Carpels* 15-20, coherent at the axis. *Styles* spreading-like a star, white; ripe carpels enclosed in the greatly enlarged and thickened sepals which are 1 in. thick and strongly imbricate the whole forming a large green globose pomiform fruit, 5-6 in. diam. Actual fruit $2\frac{1}{2}$ in. diam. *Pericarp* thin, indehiscent. *Seeds* numerous, compressed with a hairy margin.

Uses :—The juice of the fruit, mixed with sugar and water, is used as a cooling beverage in fevers, and as a cough mixture. The bark and the leaves are astringent, and are used medicinally. The fruit is slightly laxative, but is apt to induce diarrhœa, if too freely indulged in. (ROXBURGH, ROYLE, DRURY).

The fruit gives a lather with water, says Trienen, and is used as a soap.

Mr. T. P. Ghose of Dehra Dun writes in the *Indian Forester* for August 1914 :—

The fresh ripe fruits were taken and the upper layers of calyces were separated from the inner kernels which consisted mostly of pectous matter of a jelly-like consistence. The kernels being rejected, the calyces were crushed and steeped in 90 per cent. alcohol for six months in a drum with occasional shaking. The alcohol was then filtered off and the residue was pressed almost dry, and this alcohol was added to the first and the whole evaporated off under reduced pressure. The alcoholic extract was finally dried at 100° C. for further examination.

The composition of the calyces of the fresh ripe fruits as was follows :—

Moisture ...	...	...	...	...	86.40 per cent.
Alcoholic extract ...	...	...	...	...	3.00 "
Water extract ...	...	...	...	...	0.37 "
Insolubles ...	...	...	...	...	10.23 "
					<hr/>
					100.0 "

The aqueous extract was made after having extracted the calyces with alcohol, which thus represents only pectous matters, etc., left in the insoluble tissues after alcoholic extraction. The alcoholic extract examined qualitatively showed the presence of tannin glucose, malic acid and pectous bodies. Malic

acid was also identified by means of its lead salt. The composition of the alcoholic extract obtained as given above was as follows :—

Moisture	...	...	...	...	8.20
Tannin	...	...	...	...	1.40
Glucose	...	...	...	...	12.15
Malic acid	...	...	...	...	2.21
Petroleum ether solubles (fats, etc.)	...	...	...	...	0.72
Albuminoids	...	...	...	...	0.85
Ash	...	...	...	...	12.63
Pectous matters, etc.	...	...	...	...	61.84
					100.00

The 61.84 per cent. of pectous matters coming in the alcoholic extract is due to the dilution of alcohol caused by about 86 per cent. of moisture in the fresh fruit. Though originally soluble in dilute alcohol, these bodies became wholly insoluble both in water and in alcohol on anhydration. They were examined and found to be pectous bodies.

The chief ingredients of the calyces of the fresh ripe fruits are tannin, glucose and malic acid. The percentage of these three ingredients calculated on fresh and dry calyces stand as below :—

		On fresh calyces.	On dry calyces.
(1) Tannin	...	0.05%	0.37%
(2) Glucose	...	0.40%	2.02%
(3) Malic acid	...	0.07%	0.51%

N. O. MAGNOLIACEÆ.

30. *Michelia Champaca*, Linn. H.F.B.R.I., I. 42. Roxb. 453.

Syn. :—*M. aurantiaca*. Wall; *M. Rheede*, Wight.

Sanskrit :—*Champaka*, *Kachar*; *Ramyál* (Beautiful); *Champeya* *Surabhi* (Fragrant); *Chala*; (Moving).

Vern. :—*Champá*, *champaka* (H. and B.); *Kancha-namu*, *champa* (Uriya); *Tita-sapps* (Assam); *Oulia champ* (Nepal); *Chamuti*, *champa*, *chamba* (fruit) (*Chamakhri*, *Chamoti*), (Pb.); *Pivalá-cháplá*, *sona-chápha*, *kud chámpa* (Mar.); *Ras champo*, *champo*, *pilo champo* (Guz.); *Shampang*, *shembugha*, *shimbu*, *sempangam* (Tam.); *Shampangi-puvon*, *champakamu* *champé-yamu*, *káncchauama*, *gandhaphali*, *hemángamu* (Tel.); *Sampage-huvon*, *sumpaghy*, *kola sampige*, *sampige* (Kan.); *Bongas jampacca*, *champakam* (Mal.). *Sapu*, *Hapu* (Singhalese).

Habitat:—Commonly cultivated, but wild in the forests of the Temperate Himalaya, from Nepal Eastward.

A small evergreen tree. *Bark* grey, smooth, $\frac{1}{2}$ in. thick. *Wood* soft even-grained; sapwood white, heartwood light olive-brown. Young shoots silky; branchlets pubescent. *Stipules* convolute. *Leaves* 8-10 by $2\frac{1}{2}$ -4 in. shining above, pale and glabrous or puberulous beneath. *Petioles* slender, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. *Flowers* 2 in. diam., pale yellow or orange, fragrant; some consider the flowers *strongly* scented. *Peduncles* short. Buds silky. *Perianth-leaves* 15, deciduous, imbricate, in whorls of 3; the outer oblong, acute; the inner linear. Fruiting spike compact, 3-6 in. long. *Carpels* sub-sessile, ovoid, blunt, lenticillate, coriaceous, dorsally dehiscent. *Stamens* numerous, many-seriate; filaments flat; anthers linear, adnate, introrse, bursting longitudinally. Gynophore stalked; styles short. *Capsules* $\frac{3}{4}$ in.; bark brown. *Seeds* 1-2, brown when old, bright scarlet or rosy when just mature, polished, variously angled, rounded on the back, pendulous by a white thread-like funicle, after dehiscence of the capsule, embryo minute in an abundant oily albumen.

Parts used:—The flowers, fruit, leaves, roots, root-bark, oil, bark.

Uses:—According to Sanskrit writers, the flowers are bitter and are useful in leprosy, boils and itch.

The flowers and fruits are considered bitter and cool remedies, and are used in dyspepsia, nausea and fever. The leaves, anointed with Ghee, and sprinkled over with powder of Cumin seeds, are said in the *Baroda Darbar Catalogue Col. and Ind. Exhib.*, to be put round the head in cases of puerperal mania, delirium, and maniacal excitement.

TAYLOR states (*Topography of Dacca*) that the flowers mixed with Sesamum oil form an external application, which is often prescribed in vertigo. The flowers beaten up with oil are also applied to fetid discharges from the nostrils. According to RUMPHIUS, the flowers are useful as a diuretic in renal diseases and in gonorrhœa. RHEEDE states that the dried root and root-bark, mixed with curdled milk, are useful as an application

to abscesses, clearing away or maturing the inflammation, and that, prepared as an infusion, it is a valuable emenagogue.

He also states that the perfumed oil prepared from the flowers is a useful application in cephalalgia, ophthalmia, and gout, and that the oil of the seeds is rubbed over the abdomen to relieve flatulence. In Dacca, the juice of the leaves is given with honey in cases of Colic (TAYLOR).

In the *Pharmacopœia of India*, the bark is described as having febrifuge properties. Dr. KANAY LAL DEY considers it to be an excellent substitute for guaiacum.

In the *Gazetteer of Orissa*, the bark is described as stimulant, expectorant and astringent; the seeds and fruit are said to be useful for healing cracks in the feet, and the root is described as purgative.

Dr. MOODEEN SHERIFF considers the flowers to be stimulant, antispasmodic, tonic, stomachic and carminative; and describes an infusion, decoction and tincture; particularly recommending the last.

Chemistry—"The essential oil from yellow champaca flowers (*Michelia champaca* L.) has the specific gravity 0.904–0.9107 at 30°/30° C., $n_D=1.4640$ – 1.4688 at 30°C., ester value 124–146, and ester value after acetylating 199. When distilled in a vacuum it polymerises. It contains isoeugenol, benzoic acid, benzyl alcohol, benzaldehyde, cineol and p-cresol methyl ether. The white flowers (*Michelia longifolia* Bl.) yield an oil with the following characters:—specific gravity 0.897, ester value 180.0, $n_D=1.4470$ at 30°C. It contains linalool, methylengnol, methylethylactic acid probably in the form of the methyl or ethyl ester, and a phenolic substance possessing an odour closely resembling that of thymol. The yellow flowers contain a ketone melting at 165°–166°C., and yielding a hydrazone C₁₆H₂₀O₄:N.N.H C₆H₅, m. pt. 161°C."—J. Ch. I. Jan. 31st, 1912, p. 90.

31. *M. Nilagirica*, Zenk. H.F.BR.I., 1. 44.

Vern.:—Pola champa (H.); Shempangan, sempagura, shembugha (Tam.). Walu sapu (Sinhalese).

Habitat:—Higher mountains of the Western Peninsula, Ceylon.

A handsome moderate-sized tree or shrub at high elevations. Young parts silky, particularly buds. Bark brown, $\frac{1}{2}$ in. thick, cleft but not deeply into small rectangular plates.

Wood moderately hard, smooth. *Leaves* 2-4 in., oblong-elliptic or obovate-lanceolate, acute at both ends or tip, mucronate, glabrous, or puberulous only on the nerves beneath. *Flowers*, white, 3-4 in. diam. Buds $\frac{1}{2}$ -1 $\frac{1}{2}$ in., ovoid. *Perianth*—*segments* 9-12 obovate, inner acute and narrower than the outer. Stamens shorter than the gynoecium. *Ovaries* silky, with 2-4 ovules. Fruiting spike interrupted, 2-3 in. long; carpels warty, spiculate, mixed with many abortive carpels. *Seeds* bright and scarlet (Brandis).

Part used :—The bark.

Use :—The bark is made into decoction and infusion, and used as a febrifuge.

32. *Illicium Griffithii*, H. f. and Thoms. H.F.B.I., I. 40.

Vern :—Bâdayân (Marâthi).

Habitat :—Bhotan; Khasia hills.

A shrub. Branches angular, glabrous. *Leaves* elliptic-lanceolate, 2-4 by 1-2 in., acute at both ends, coriaceous, shining. *Flowers* 1 $\frac{1}{2}$ in. diam. *Perianth*—*segments* about 24. *Sepals* 6, orbicular. *Petals* 18, outer oval, inner smaller, narrow. *Carpels* with a thin fleshy pericarp, woody endocarp, and short subulate incurved beak (Hooker).

Copses in Bhutan and the Khasia Hills, 4-5,000 ft.

Use :—The authors of *Pharmacographia Indica*, (Vol. I. p. 40) write that it occasionally finds its way into the market. It is used as a substitute for *Illicium verum* which is a native of Cochin-China. Star-anise is aromatic, stimulant and carminative.

"The fruit of *I. Griffithii* would appear to contain some bitter principle as well as tannin." (*Pharmacographia Indica*, Vol. I. p. 41).

N. O. ANONACEÆ.

33. *Uvaria narum*, Wall. H.F.BR.I., I. 50.

Vern.:—Narum-panel (Malay). RHEEDE.

Habitat:—Forests of the Western Peninsula; and in the Central Provinces of India; Ceylon ascending to 4000 ft.—Widely diffused in Southern India.

A woody climber; twigs glabrous. *Leaves* 4–6 in., oblong, acuminate, very shortly stalked, glabrous. *Flowers* solitary, 1-1½ in. diam. Buds globose, stellate-tomentose. Sepals distinct, or nearly so, rounded, apiculate. Petals connate at base, broadly ovate, acute, incurved, densely pubescent. Ripe carpels very numerous, pendulous on slender stalks, 1 in. long, oblong—ovoid, 1-1½ in., smooth, bright scarlet-crimson. Colour of flowers yellowish—green.

Part used:—The root.

Uses:—The oil obtained from the roots by distillation, as well as the root, are used medicinally in various diseases. The root is fragrant and aromatic, and the bruised leaves smell like cinnamon. (RHEEDE).

34. *Anona squamosa*, Linn. H.F.BR.I., I. 78. Roxb. 453.

Vern.:—Atá, kátál (Ass.); Maudar gom (Santal); Sirpha (Mal.); Sita-palam or Sita-pázham (Tam.); Sitapandn (Tel.); Sharifah, át or áta, Sitáphal, (H. Deck. Guj. Mar.); Atá, lemá (B.).

Habitat:—Introduced from the West Indies, and naturalized throughout India.

A small tree wholly glabrous. *Bark* thin, grey. *Wood* soft, close-grained, greyish-white. *Leaves* 2-3 by ¾-1½ in., membranous, oblong or oblong-lanceolate, obtuse or acuminate, glaucous and pubescent when young; base acute, pellucid-dotted, with a peculiar smell. *Flowers* solitary or in pair,

1 in. long, pubescent on pedicels as long as the flowers. Exterior *Petals* 3, narrow-oblong, lanceolate, triquetrous, thick and fleshy, 3; interior minute or wanting. *Sepals* small. *Stamens* indefinite, crowded round a hemispherical torus. *Connective* overlapping the anthers. *Carpels* many, subconnate, style oblong. *Ovule*, 1, erect. *Ripe carpels* confluent into a many-celled ovoid or globose many-seeded fruit. Fruit fleshy, areolate, 2-4 in. diam, juicy with the pleasant and agreeable odour of the English Heliotrope. *Seeds* oblong, brownish-black.

This is the genuine *Custard Apple* of India.

A native of the West Indies, naturalized in India, especially the Western Peninsula, and the Dekkan, Bijapur; in the Madras Presidency in the Krishna district. Wild in the old Forts of the Dekkan, cultivated as far as Gurdaspur in the Punjab.

Parts used:—The fruit (both ripe and unripe); leaves, seeds, roots.

Uses:—The ripe fruit is medicinally considered a maturant, and when bruised and mixed with salt, is applied to malignant tumours to hasten suppuration. The seeds contain an acrid principle fatal to insects, and the dried unripe fruit, powdered and mixed with gram flour, is used to destroy vermin. An infusion of the leaves is considered efficacious in prolapsus ani of children. The root is considered a drastic purgative; natives administer it in acute dysentery. It is also employed internally in depression of spirits and spinal diseases. (T. N. MUKERJI.) The seeds are a powerful irritant of the conjunctiva. Lt. Col. Kirtikar, while in charge of the Thana Central Prison, came across a case in which a Life-Convict used the seed powder in destroying the cornea of both eyes to produce blindness for the purpose of avoiding being sent to the Andamans to undergo his sentence there.

The bruised leaves with salt make a cataplasm to induce suppuration (Atkinson).

35. *A. reticulata*, Linn. H.F.BR.I., I. 78; Roxb. 453.

Vern:—Louná, Rám-phal (H.); Noná (Beng.); Gom (Santal);

Rám-phal (Bomb. Deck., Mar., Guj., Kan.); Rámsitá or rámsitu-plam (Tam.); Rámá-pandu, ráráphalam or rárá-chandar pandu (Tel.).

English Names:—The Bullock's Heart, or true Custard Apple of the West Indies.

Habitat:—A small tree, naturalised in India, occurring in Bengal, Burma and South India.

A large tree often growing 20-40 ft. *Leaves* oblong or oblong-lanceolate, quite glabrous, smooth or roughish beneath; 5-8 by $1\frac{1}{2}$ -2 in., base acute; petiole $\frac{1}{2}$ in. *Flowers* 2-3 together on lateral peduncles. *Sepals* 3, small, valvate. *Petals* 3, narrow, oblong, thick. *Fruit* subglobose, roughish outside with pentagonal areoles; tawny-coloured when ripe.

Much cultivated in the Bombay gardens. A native of the West Indies quite naturalized.

Parts used:—Bark and fruit.

Uses:—The bark is said to be a powerful astringent, and to be much used as a tonic by the Malays and Chinese. The fruit is reported to be used in the West Indies and by the natives of America, as an anti-dysenteric and vermifuge. (Warr's Dictionary, Vol: I. p. 259).

36. *Bocagea Dulzelii*, Hk. f. and Thoms, H.F.B.R.I., I. 92.

Syn.—*Sageræa laurina*, Dalz.

Vern.—Sajeri. Kochrik. Harkinjal (Maráthi). Andi (Bombay).

Habitat.—Forests of the Konkan and Travancore.

A middle-sized, evergreen, glabrescent tree. *Leaves* shining, coriaceous, thick, 5-9 by $1\frac{1}{2}$ -2 in., narrow, oblong, acute or obtuse; base rounded or acute. Petiole $\frac{1}{4}$ in. *Flowers* white, 2-sexual, $\frac{1}{4}$ - $\frac{1}{2}$ in. diam; crowded in fascicles of 1-15 on woody tubercles. Pedicels $\frac{1}{4}$ - $\frac{1}{2}$ in. Bracteoles several, scaly basal. *Sepals* orbicular, distinct, slightly imbricate; outer petals $\frac{1}{2}$ in. broad, ovate, larger but not twice the size of the inner.

Stamens 12-18; anther-cells contiguous, outer stamens sometimes without anthers. Ripe *Carpels* nearly sessile, 1 in. diam., globose, glabrous usually containing about 2 matured seeds.

Uses.—In the Konkan the leaves are used for fomentation by the natives. They have a pungent, astringent and bitter taste. (Dym. Pharm. Ind. Vol. I. P. 46).

37. *Polyalthia longifolia*, Benth and Hk. f.
H.F.BR.I., 1. 62. Roxb 455.

Syn.—*Gualteria longifolia*, Wall.

Vern.—Asok; Debdari, Devadârû, Deodar (H). Devdarû; Devada (B). Devdârû (Uriya). Asok, Asoka, Asopular, Asûpâl (Bomb); Ashopulo (Guj); Devadârû, Asoka, Asokam (Tel) Assothi (Tam); Asoka, putrajiva (Kam); in Ceylon Tamil it is Mara-illupai.

Habitat.—Cultivated throughout India, as an avenue tree in Tanjore and the Western Peninsula. Common in Ceylon and in Bombay Gardens. It is also found as a roadside tree in Bombay, much used in decorations of houses on festive occasions.

A large erect tree, very handsome with shining wavy-margined leaves on slender long branchlets. *Bark* thick, rather smooth, young parts glabrous. *Wood* yellowish-white, rather soft, medullary rays conspicuous. *Leaves* long, 6-9 in. shortly stalked, oblong or ovate-oblong, very gradually tapering into long attenuate apex, acute or rounded base, finely undulate, glabrous, thin, pellucid-dotted. *Flowers* greenish-yellow in axillary umbels on very short racemes mostly from the old wood, 3-10 or more together. *Pedicels* 1 in. or more long, slender, pubescent, with a hairy bractlet half way up. *Sepals* ovate-triangular, obtuse, tomentose. *Petals* $\frac{1}{2}$ in. or more, lanceolate-linear, tapering, undulate, pubescent, the inner rather broader. *Carpels* about 8, ovoid, 1 in. long, glabrous, on stalks $\frac{1}{2}$ in. long.

Use.—It is used as a febrifuge in the Balasore District of Orissa (Sir W. W. Hunter).

N. O. MENISPERMACEÆ.

38. *Tinospora tomentosa*, Miers. H.F.B.I., I. 96.

Vern.:—Padma-guluncha (B).

Habitat:—Tropical thickets in Bengal; always rare.

A climbing shrub. *Bark* pustular. Shoots tomentose. *Leaves* orbicular-cordate, more or less 3-lobed, pubescent above, tomentose beneath, 3-6 in. diam. Petioles as long. *Racemes* usually simple, solitary or fascicled. *Flowers* fascicled in the axils or deciduous bracts. *Sepals* 6, 2-seriate, inner longer, membranous. *Petals* 6, smaller. *Male-flowers*: Stamens 6, filaments free, tips thickened. Anther cells obliquely adnate, bursting obliquely. *Female-flowers*: Staminodes 6, clavate; Ovaries 3. Stigmas forked. *Drupe* 1-3, dorsally convex, ventrally flat; fusiform, orange-yellow. Endocarp tubercled, dorsally keeled, ventrally concave. *Seed* grooved ventrally or curved round the intruded sub-2-lobed endocarp. Albumen ventrally ruminant. Cotyledons foliaceous, ovate, spreading.

Use:—It possesses the tonic properties of the common *Gulunchâ*, *T. cordifolia* (Prain's Flora of the Sunderbans, Page 286).

39. *T. crispa*, Miers. H. F.B.I., I. 96.

Syn.:—Menispermum verrucosum. Hm. Rox. Fl. Ind.

Vern.:—Titha-Kinda (Sinhalese).

Habitat:—From Sylhet and Assam to the Eastern Peninsula, Ceylon.

Stem widely climbing and twining, strongly warted. *Leaves* 4-5 in., broadly orbicular-cordate, suddenly acuminate, 7-veined, glabrous on both sides, thin. Petioles 3-4 in., thickened and twisted at base, smooth. *Flowers* $\frac{1}{2}$ in. long, green, campanulate, 1-3 together, on very slender pedicels, in the axils of fleshy, small persistent bracts, rather distantly arranged in slender pendent spicate racemes or panicles 4-6 in. long from axils of old leaves. *Male-flowers*:—stamens adnate to base of petals. *Female-flowers*:—Anthers, square, stamens adnate

to the base of the petals. *Drupe* elliptic, oblong, 1 in. long, size of an olive, pale-yellow.

Properties and Uses:—Possesses the bitterness and probably the tonic properties of *gulanchā* (Ph. Ind.)

40. *T. cordifolia*, Miers. H.F.B.I., I. 97.

Syn.:—*Menispermum cordifolium*, Roxb., *Cocculus cordifolius*, D.C.

Habitat:—Throughout tropical India, from Kumaon to Assam and from Behar and the Concan to the Carnatic. In the Dun and Shaharanpur forests, fairly common.

Sans.:—Guduchi (bitter plant), Kundali (coiled), Chhina (cut) Vayasthā (old), Amrita-Vallari (immortal Creeper), chhinnodh-hana (growing after being cut), Chhinnaruha, Amrita (nectar), Jwara-nāshini (febrifuge) Vatsādani (eating its own offspring), Chandrapasa deriding the moon), Jivanti (living), Chakra-Lakshana (wheel-shaped.)

Vern.:—Gurach, gurcha, giloe, gulancha, gul-bet, (extract)-palo, sut-gilo, satte-gilo (root)-ghlancha-ki-jar, (Hind.); gulancha, gurach, giloe, nim-gilo, gadancha (Beng.); zakhmi haiyat, gilo, garum, garham, batindu, (Pb.) (Extract)-palo, sut-gilo (Sind); Gulwel, (CP.); Gulvel, guloe, gharol, giroli, ambarvel; (Bomb.); Gulaveli, gulavela, gulwail, guloe, gharol, (Mar.); Gado, gulvel, galo, (Guz.); gul-wail, gul-bel, gulo, (extract)-polo, sat-gilo, gulbel ka-sat, (Dec.); Shindil-kodi, (extract)-shindil-shakkarai (root)-shindil, kodi-ver, (Tam.); Tippa-lige guluchi, guduchi, guricha, manapala, tippatingai, (extract) Tippa-tige-sattu, (root)-tippa-tege veru (Tel.); Amrita-Calli, amruta-Calli, (Kan.); Amruta valli, citamerdu, amruta, chitramruta (Malay); Amritvel, amritwel (Goa).

A glabrous, succulent, climbing shrub, often reaching a great height and sending down long thread-like aerial roots, closely warted. *Bark* grey or creamy-white, deeply cleft in spiral longitudinal clefts, the space between the clefts usually dotted with large rosette-like corky lenticels. *Wood* white, soft, porous. Pores small to large, rather scanty, irregularly arranged between the few broad medullary rays (Gamble). *Leaves* 2-4 in., broadly

cordate, glabrous, thin, acute or acuminate. Petiole $1\frac{1}{2}$ -3 in., slender, thickened and curved at base. *Flowers* greenish-yellow, or yellow, large for the order, $\frac{3}{4}$ in. diam. *Males* in clusters of 1-6 on slender branches of a drooping panicle exceeding the leaves. *Females* in shorter racemes, solitary. Male-flower:—stamens, free, but wrapped in the petals. Female flower:—Stigma dilated, laciniate. Ovaries 3. *Drupe* of 1-3, ripe carpels size of pea, somewhat ovoid, apiculate, smooth, red, succulent. Endocarp smooth. *Seed* generally curved round the intruded endocarp.

Uses:—The following pharmaceutical preparations can be made of the plant:—

1. *Tincture of Gulwel*.—Take 4 ounces of the stem, not very young and thin, nor very old and thick, but of medium age and size, together with the aerial roots (Kanjilal); cut into thin slices, and steep them in a pint of proof-spirit for seven days and press out of a Tincture-press. Dose 1-2 drachms.

2. *Cold Infusion*.—Take one ounce of the stem, as directed above, cut into thin slices, steep them in ten ounces of cold water for four hours, and strain. Dose 1-3 ounces.

3. *Extract of Gulwel*.—The well-grown stem is sliced finely and bruised in cold water, well steeped in it for four hours and then kept on a slow fire, until it thickens into a semi-solid or almost pliable mass. Dose 5-15 grains.

4. *Gulwel "Satwa,"* which means the separation of the solid parts, principally the *Starch*. Slices of a well-formed stem are finely pounded into a pulp with water and strained. The water so strained is allowed to remain in a pan, undisturbed. Much white powdery matter will, after a time, deposit at the bottom of the pan. The supernatant water is removed and the deposit allowed to dry in the air or in the sun, but never heated on fire. Pandit-Jaya Krishna Indrajī says that, as soon as the deposit settles, the sooner it is dried the better. The quantity thus obtained is small, but clear white. If the mashed product, together with the water, be left over-night, the deposit, after settling down, turns blackish, although a larger quantity of the starch and other solids is obtained from the sediment. Dose

10-30 grains. The starchy matter is administered in ghee, or with molasses, or in sugar and water, or in milk. This information is collected from the works of Dr. Tribhuvandas Motichand Shah of Junagadh and Pandit Jaya Krishna Indraj of Porebundar. (1909-1910).

In a paper, entitled "A note on some Indian Drugs," with exhibits of medicinal preparations, read before the section of Pharmacology of the 2nd Session of the International Medical Congress of Australasia, held at Melbourne (Victoria) in January 1889, Surgeon K. R. Kirtikar made the following observations on *T. cordifolia* (Gulwel or garola). The preparation exhibited was a powder of the dried stem of the plant prepared by the late Mr. M. C. Pariera of Bandra, who was for a long time connected with the Government Medical Stores of Bombay, under the late Brigade-Surgeon W. Dymock. Surgeon Kirtikar said as follows:—"The powder of the stem is used in making an infusion in the proportion of one ounce of the powder to ten fluid ounces of cold water. The medicinal value of the plant is due to a small quantity of *Berberine*. It is used as an alterative and tonic, and has enjoyed the reputation among ancient Hindu writers of being an aphrodisiac; but as a drug it being never prescribed alone as an aphrodisiac, its reputation as such is of a doubtful nature. The dose of the infusion is one to three ounces. There is a starch obtained from the roots and stems of the plant which goes under the name Gulweliche-satwa (the starch of Gulwel), which is similar to Arrow-root in appearance and effect. It answers not only as a remedial medicinal agent in chronic diarrhoea and some forms of obstinate chronic dysentery, but it is also a valuable nutrient, when there is intestinal irritability and inability to digest any kind of food. I have myself had experience of the usefulness of this starch. Dr. Dymock says 'through not having been washed, the starch has been found to retain some of the bitterness of the plant.' I have several times tasted the starch myself and have not found it bitter to any appreciable degree, probably from the fact that my specimens were different from those of Dr. Dymock (and perhaps fresh and better-washed); but I have no doubt that the starch has some medicinal property

in it from the minute traces of *berberine* which the plant is supposed to contain. I think also that this drug is useful where there is an acid diarrhoea, due to an acidity of the intestinal canal or acid dyspepsia. It is useful in relieving the symptoms of rheumatism. There is another preparation of this plant—the *succus* (juice), fresh prepared from the fresh plant. It acts as a powerful diuretic. It is prescribed by ancient Hindu physicians in gonorrhoea with advantage. Considering that in the earlier stages of gonorrhoea we now try to reduce the acidity of urine by alkaline mixtures, it is probable this drug acts by reducing the acidity of urine in gonorrhoea. Dose of the *succus* 2-3 drams in water, milk or honey, thrice daily." (See Congress Proceedings, Melbourne p. 947. 1889).

In the Bombay Druggists' shops the starch of Gulwel is found not unoften adulterated. "I was supplied not once, but several times, with the English-made powder of *Zea Mays*—our common Makâ (corn-flour) for the Satwa of Gulwel. Sometimes I was given masses of the common Attah (wheat flour)." (See K. R. Kirtikar's Presidential Address 5th All-India Ayurvedic Conference, Muttra, 1914, p. 14).

Speaking of its employment as an antiperiodic, Waring states, that he employed it in twenty cases of ordinary quotidian fever in Burma; and in each case it prevented the accession of the cold stage, but it did not appear to diminish the severity, or prevent the regular return of the hot stage, a peculiarity, he adds, not observed by him in the use of any other remedy of the same class. *Gulantha* is also regarded by the natives in certain parts of India as a specific for the bites of poisonous insects and venomous snakes.

41. *Anamirta Cocculus*, W. and A. H. F.B.I., I. 98.

Syn. A. *Paniculata*, *Colebr.* *Menispermum cocculus*, Linn.

Habitat :—Eastern Bengal; Khasia hills; Assam; and from Concan and Orissa to Ceylon, up to 2,000 ft.

Sansk. :—Kâkamâri.

Vern. :—Kâkamâri (H. and B.); Kâkaphala; Vâtoli (Bomb.);

Kakkây-Kolli-Virai (Tam.); Kâki-Champa; Kâkâ-Mari; Vittu (Tel.); Kâkamâri-bija (Kan.); Karantâ-Kattin-Kâya; Polluk-Kaya (Mal.); Titta-wel (Sinhalese).

A large woody twiner, bark thick, vertically furrowed or corrugated, young shoots glabrous. *Leaves* 3-6 in., broadly ovate, acute or obtuse, rounded or subcordate at base, sub-coriaceous, glabrous above, paler and with very small tufts of hair in the axils of the veins beneath. *Petioles* 2-4 in., thickened and prehensile at lower ends. *Flowers* pale, greenish-yellow, sweet-scented, $\frac{1}{2}$ in. diam., with 2 or 3 small bracts at base, on short, thick, divaricate pedicels, arranged on the horizontal branches of large glabrous panicles, 8-12 in. long, springing from the old leaves, buds globular. *Sepals* equal ultimately reflexed. *Petals* 0; *Male Fl.*:—Anthers forming a globose head on the short, stout column of coherent filaments; *Female Fl.*:—Carpels usually 5, on short, globose gynophore, surrounded at base by a ring of ten very small bifid, fleshy staminodes, smooth, stigmas reflexed. Ripe carpels 1-3 (usually 3) on thickened branches of enlarged gynophore, nearly globose, $\frac{1}{2}$ in., smooth, black.

Parts used:—The berries, and leaves.

Uses:—The bitter berries are sometimes used in the form of an ointment. This ointment is employed as an insecticide, to destroy pediculi, and in some obstinate forms of chronic skin diseases. (BENTLEY and TRIMEN).

The fresh leaves are used in Bengal as a snuff in the treatment of quotidian ague.

Chemistry:—Pikrotoxin is an astringent principle of the fruit. The commercial product usually melts between 192° and 200° , but after recrystallisation from water invariably yields a product melting at $199-200^{\circ}$; it is extremely bitter and very poisonous, producing similar effects to those obtained with strychnine. Paternò and Ogliastro, Schmidt, and others regard it as a definite compound which is readily decomposed into pikrotoxinin and pikrotoxin, but, according to the authors (Richard Joseph Meyer and P. Bruger), it is merely a mixture of these two indefinite, but not molecular, proportions, namely, 54-55 per cent. of pikrotoxinin and 45-46 of pikrotoxin. It may be partially separated into the two constituents by boiling with benzene or chloroform, or by treatment with barium hydroxide; the only method which gives anything like quantitative results is that with bromine water.

Pikrotoxinin, $C_{15}H_{16}O_6$, is best obtained from *pikrotoxin* by brominating the latter, when in hot aqueous solution, with a slight excess of bromine water, and then, by means of zinc dust and acetic acid, removing the bromine from the monobromopikrotoxinin, which crystallises out; it crystallises from hot water in colourless, anhydrous needles, but from cold aqueous solutions in rhombic plates containing $1H_2O$, melts at $200-201^\circ$, is readily soluble in all the usual solvents on warming, and also in cold alcohol or chloroform; it is also soluble in alkalies, but is not reprecipitated on the addition of acids. Sulphuric acid develops an intense orange red coloration, and when hydrogen chloride is led into an ethereal solution of the compound, polymerisation occurs, and *pikrotoxin*, melting at $308-310^\circ$, is formed. Aqueous solutions reduce ammoniacal silver nitrate in the cold, but it contains neither an aldehydic nor a ketonic group. It has an extremely bitter taste, and is the active principle of *pikrotoxin*; its specific rotatory power $[\alpha]_D = -5.85^\circ$.

Bromopikrotoxinin, $C_{15}H_{15}BrO_6$, which is most readily obtained by adding bromine water to a hot, nearly saturated, aqueous solution of *pikrotoxinin* until the solution remains permanently yellow, may be purified by recrystallisation from absolute alcohol; it separates in glistening needles, melts at $259-260^\circ$ (Schmidt gives $250-255^\circ$; Paternò and Ogialoro give $240-250^\circ$), and has $[\alpha]_D = -132.5^\circ$.

Chloropikrotoxinin crystallises from alcohol in a mixture of needles and plates, melting at 272° .

Iodopikrotoxinin, obtained by the action of iodic acid and a solution of iodine in potassium iodide $C_{15}H_{14}O_6Ac_2$, as it can readily be obtained by the action of acetic chloride on *pikrotoxinin*; it sublimes in slender needles melting at $254-255^\circ$ and forms an unstable compound with bromine.

Pikrotoxin, $C_{15}H_{18}O_7$, is best obtained from the filtrate from bromopikrotoxinin, part separating out on cooling, whilst the remainder may be obtained by evaporation; it can be purified by several extractions with small quantities of hot chloroform, followed by recrystallisation from water; it forms small, felted needles, or thick, rhombic prisms, melting at $248-250^\circ$, is readily soluble in absolute alcohol or acetic acid, but only sparingly in ether, chloroform, or benzene. Its specific rotatory power $[\alpha]_D = -64.7^\circ$, and it reduces Fehling's solution, etc., but only on warming. Its molecular formula has been determined by molecular weight determinations and by the analyses of its benzoyl and acetyl derivatives.

Benzoylpikrotoxin, $C_{15}H_{17}O_7BZ$, crystallises from absolute alcohol in colourless needles, melts at 236° , and is readily soluble in chloroform, sparingly in ether or alcohol.

Eibenzoylpikrotoxin, obtained when *pikrotoxin* (1 mol.) is heated with benzoic chloride (3 mols.) at 190° , crystallises from alcohol in needles melting on a hot aqueous solution of *pikrotoxinin*, crystallises from alcohol in colourless needles and melts at $198-199^\circ$.

Lromopikrotoxic acid, $C_{14}H_{16}BrO_6 \cdot COOH + H_2O$, is obtained when 10 per cent. potassium hydroxide solution is slowly added to finely divided bromopikrotoxinin suspended in 10 times its weight of boiling water, until all has dissolved; on the addition of hydrochloric acid, the acid crystallises out in colourless needles, melting at $245-246^\circ$; it has no bitter taste, and is optically

active $[\alpha]_D = -62.6^\circ$. The calcium salt, $(C_{15}H_{15}BrO_7)_2 Ca + 5H_2O$, potassium salt, with $2H_2O$, ammonium salt, and mercurous salt have been prepared.

Picrotoxic acid, $C_{15}H_{15}O_7$, obtained in small amount by the removal of bromine from the bromo-acid by the aid of sodium amalgam in alkaline solution, crystallises from water in needles melting at $229-230^\circ$, and has no bitter taste; its aqueous solution has strong reducing properties, and it readily undergoes decomposition in both aqueous and ethereal solution.

The substance obtained by Paternò and Ogliastro by the action of sodium acetate and acetic anhydride on pikrotoxin, and described as an unsaturated acid, is shown to be *diacetylpikrotoxinin*, at $247-248^\circ$. When a large excess of benzoic chloride is employed, no definite product is obtained.

Acetylpikrotoxin, $C_{15}H_{17}O_7Ac$, crystallises from benzene, alcohol, or acetic acid in glistening plates melting at $244-245^\circ$, and is probably identical with the compound described by Paternò and Ogliastro as *diacetylpikrotoxinin* and melting at 227° . When pikrotoxin is allowed to remain in contact with acetic chloride for 24 hours at the ordinary temperature, and then heated until complete solution ensues, two compounds are obtained. *Anhydrodiacetylpikrotoxin*, $C_{15}H_{14}O_6Ac_2$, which is precipitated, on the addition of alcohol, in crystalline masses melting above 300° , and *diacetylpikrotoxin*, $C_{15}H_{16}O_7Ac_2$, which is obtained as an oil from the alcoholic mother liquor; when it is hot, aqueous solution is allowed to cool, drops of oil separate, which solidify to crystalline needles melting at $207-210^\circ$; these contain $2H_2O$.

Attempts to convert pikrotoxin into pikrotoxinin by removal of the elements of water have not proved successful.

When warmed with fuming nitric acid, pikrotoxin yields a nitro-derivative, $C_{15}H_{15}O_6 \cdot NO_2$, *anhydronitropikrotoxin*, melting at 260° .

J. Ch. S. 1899 A I. 226-227.

42. *Cosciniun fenestratum*, Colebr. H.F.B.I., I. 99.

Syn.:—*Menisperm fenestratum*, Gaertn.

Vern.:—Jhâr-ki-haldi, or Jhâdi haladi (Dec.); Haldi-gach (B.); Mara-Manjal (Tam.); Mânû pasupu (Tel.); Marada-arishina (Kan.) Veniwel. (Mar.; and Sinhalese).

Habitat:—Western Peninsula, Central and South India. Malacca, Singapore, Ceylon.

A woody climber, bark smooth, young shoots densely but finely yellow-tomentose. *Leaves* large, 4-8 in., broadly ovate or rounded, suddenly acute, truncate, rounded, subcordate or slightly peltate at base, entire, glabrous above, densely felted, with fine yellow tomentum beneath, strongly 5-7-nerved;

nerves and reticulated veinlets very prominent beneath. Petioles 3-4 in. *Flowers* sessile in small dense rounded heads, which are long-stalked and umbellately or racemously arranged in the axils of the leaves. *Pedicels* yellow-tomentose; bracts beneath the flowers numerous, small, imbricated. *Sepals* rounded, persistent. Petals ovate, spreading. Female fl.:—Carpels hairy, styles filiform, reflexed. Ripe carpels (Drupes) 1-3, globose, $\frac{3}{4}$ in., densely tomentose, brown.

Part used:—The root.

Use:—The root is extensively used in the hospitals of the Madras Presidency as an efficient bitter tonic. A writer, quoted by Christie, says of Ceylon that this root is viewed "as a very good substitute for Calumba. I have used it with good results in the form of tincture and infusion. It has also antiseptic properties to a great extent, and can be used for dressing wounds and ulcers." The wood is of a bright yellow colour, and is valued as a bitter tonic by the Sinhalese.

Dr. Moodeen Sheriff considered the action of the drug to be "antipyretic, antiperiodic, tonic and stomachic," and useful "in slight cases of continued and intermittent fevers, debility, and certain forms of dyspepsia. It may be used in place of Cinchona, Gentian or Calumba, called "False Calumba." A yellow dye is also obtained from it.—*Trimen*. "Used in diabetes, and also in cases of suppression of lochia." (Watt).

43. *Cocculus villosus*, DC. H.F.B.I., I. 101.

Syn.:—*Menispermum hirsutum*, Linn; *Holopeira villosa*, leviscula and auriculata, Miers.

In the Concan the *Vaids* give this plant the Sanskrit name of *Vana-tiktika*. *Pâtālgarudi*, Vatsādani (Sansk.).

Vern.:—Jamti-ki-bel, hier, dier, (H.); Kursan, Zamir (Sind); Vasana-vela *Hundir*, *Tānvel* (Mar.); Wassan-wel, parwell, (Bomb.); Vevdi (Guj) Vadhino vel (Porebunder) Kāttukkodi (Tam.); Dusari-tige, Chipura-tige, Katletige (Tel.).

Habitat:—Throughout tropical and sub-tropical India, from

the base of the Himalaya to Malabar and Pegu. (Absent in the Eastern Peninsula). Ceylon.

A small, much-branched, straggling climber. Branches long, slender, twining, striate, hairy-pubescent. *Leaves* 1-1½ in., deltoid-ovate, very obtuse, apiculate or mucronate, tapering or truncate at base, almost entirely glabrous above (save when young), slightly hairy on veins beneath, ciliate at margin, 3-5-veined at base. *Petiole* ¼ in., hairy; *Male fl.*:—in small cymose panicles on very slender, axillary peduncles shorter than the leaves, bracts subulate, hairy. *Female fl.*:—2 or 3 together in axillary clusters; Sepals villous, outside petals, bifid, lobed at sides. *Male fl.*:—Stamens with filaments hairy at base. *Female fl.*:—Carpels smooth. *Drupe*s (Ripe carpels) small, black-purple, ⅓ in., endocarp bony, horse-shoe-shaped or rather annular, with the centre perforated, sharply keeled along the back, the sides with strong transverse ridges.

Parts used:—The root and leaves.

Uses:—"The juice of the leaves, mixed with water, has the property of coagulating into a green jelly-like substance, which is taken internally, sweetened with sugar, as cure for gonorrhœa. Roxburgh says—"A decoction of the fresh roots, with a few heads of pepper, in goats' milk, is administered for rheumatic and old venereal pains; half a pint every morning is the dose. It is reckoned heating, laxative, and sudorific."

"In the Concan, the roots rubbed with Bonduc nuts are administered as a cure for belly-ache in children; and in bilious dyspepsia, they are given in 6 *massa* doses, with ginger and sugar." (Dymock.)

In Sind, the root and leaves are used in headache and neuralgic pains. (Murray.)

The root is said to be alterative and a good substitute for Sarsaparilla.

According to the Pharmacopœia of India, this possesses the bitterness, and probably the tonic properties, of *gulan*cha. (*Tinospora cordifolia*).

"This is a common hedge-plant in the Konkan, where it is

generally used as a refrigerant, and also as a gentle laxative. It has been extensively used as an alterative in chronic rheumatic and venereal diseases. I exhibit two preparations:—(1) A liquid extract obtained from the root. Dose one dram in water, or goat's milk, thrice daily. (2) A syrup of the leaves. Dose one to two drams. Both the preparations were made for me by Mr. M. C. Pareira of Bandra, for exhibition at this Congress." (Surgeon Kirtikar at the Pharmacological Section, Melbourne Medical Congress, Australasia. See Proceedings, p. 947-1889.)

44. *C. Leaeba*, D.C. H.F.B.I., I. 102.

Vern.:—Vallur, illar-billar; parwatti (Guj.); vehri (Pb. and Sindhi); Ullar-billar (Sindh).

Habitat:—Drier parts of Western India, the Punjab, Sindh, and the Carnatic valleys; below Simla, plains of India ascending to 3,000 ft.

Part used:—The whole plant.

A climbing shrub. Branchlets puberulous, long, slender; leaves very variable, linear-oblong, oblong or trapezoid, entire or 3-5-lobed, glabrate, usually obtuse and mucronate; base cuneate, rounded, young, hoary, old, often glaucous on both surfaces. Pedicels $\frac{1}{2}$ - $\frac{1}{4}$ in. *Male flowers* fascicled in small sessile clusters in the axils, and on woody tubercles. Females solitary, 1-3, sessile, at the end of short axillary stalks. *Drupe*s dark purple, $\frac{1}{2}$ - $\frac{1}{3}$ in.

Uses:—It is used in Sindh and Afghanistan in the treatment of intermittent fevers and as a substitute for *Cocculus Indicus*.

45. *Pericampylus incanus*, Miers. H.F.B.I., I. 102.

Vern.:—Barak Kanta (B).

Habitat:—Sikkim, Assam, the Khasia hills, Chittagong, throughout the Eastern Peninsula, Malay Peninsula and Archipelago.

A tomentose climbing shrub. Stem cylindrical and grooved. Wood in wedges, separated by broad medullary rays. Branchlets

tomentose, then glabrous. *Leaves* membranous from a straight or cordate, sometimes slightly peltate base, suborbicular, obtuse, acute or retuse; pale beneath; 5 basal nerves (Brandis). *Petiole* 1-2 in. *Inflorescence*. Cymes 2-3-chotomous, often many and superposed. *Peduncles* 1-2 in., axillary. *Sepals* villous, 6, with three bracts, outer smaller, inner spatulate. *Petals* 6 cuneate-acute, says Hooker, margins incurved. *Male flowers*:—6 stamens; filaments cylindric, anthers adnate, bursting transversely. *Female flowers*:—Staminodes 6, clavate, ovaries 3; styles bifid, segments subulate. *Drupe*s red, subglobose, the size of a pea. Endocarp horse-shoe-shaped, dorsally crested and echinate; sides excavated, *seed* curved. Cotyledons elongate, flat, scarcely broader than the radicle.

Part used:—The root.

Use:—The roots have long been held in great repute among snake-charmers in India as an antidote to the bites of poisonous snakes. Surgeon-Colonel D. D. Cunningham has proved that a fluid extract of the roots, when injected into the bitten place, possesses decided remedial power, though it has no general action. It acts by precipitating the poison, and thus rendering it inert when brought into direct relation with it, prior to the absorption of the venom into the system generally.

46. *Stephania hernandifolia*, Walp. H.F.B.I.,
I. 103.

Syn.:—*Cissempeles hexandra*, Roxb, *C. hernandifolia*, Willd.,
Clypea hernandifolia, W. and A. Wight Ic. t. 939.

Sans.:—Ambasthâ; pāthā.

Vern.:—A'knādi; Nemuka; agnad (B.) Lupukētiya-wel (Sinhalese).

Habitat:—From Nepal to Chittagong. Singapore, Ceylon, Malaya.

A slender twiner, shoots glabrous. *Leaves* 2-4 in., round-ovate, acute or obtuse, peltate, cordate or truncate at base, glabrous, glaucous beneath. *Petiole* 1-2 in., slender, divaricate. Flowers greenish-white, very small, nearly sessile in small umbels

at ends of branches of long-stalked, axillary umbels; bracts subulate. *Male flowers*:—Sepals nearly equal, obovate, obtuse; petals much shorter, staminal column short, summit expanded. *Female flowers*:—Sepals acute; petals shorter, styles subulate. Fruit scarlet, solitary, sessile, small, $\frac{1}{8}$ in., compressed, glabrous. Endocarp strongly tubercled on back and sides. Seed curved almost into a ring.

The head of fruit looks as if it were the produce of a single flower, instead of an umbel of several sessile ones (Trimen).

Use:—The root is regarded as light, bitter, astringent and useful in fever, diarrhoea, urinary diseases, dyspepsia, etc. Sir W. O'Shaughnessy speaks highly of this plant.

47. *S. rotundifolia*, Lour. H.F.B.I., I. 103.

Vern.:—Purba (Dehra Dun).

Habitat:—Tropical and temperate Himalaya, from Sindh eastward to the Khasia Hills and Pegu. Valleys below Simla; in the ravines of Dun and the Lower Hills. Southern Hills of the Western Peninsula. Siam, Cochin-China.

A tuberous-rooted, large, climbing shrub. Roots subglobose. "Wood soft, spongy, with large, loose pith arranged in wedges, separated by broad medullary rays, and concentrically by a belt of soft similar tissue. The bark gives fibre, sometimes used for fishing lines." (Gamble). Branchlets glabrous. Leaves peltate, with 9-10 radiating nerves, ovato-rotundate, broad-ovate or sub-orbicular, often repand or sinuate-lobed, glabrous, 3-7 in. diam., obtuse, acute or acuminate, pale beneath. Petiole 3-9 in. Peduncle variable, usually slender; of the females, stout. Umbels axillary, compound, in lax cymes; rays of umbels long or stout; bracts subulate. *Flowers*, yellow or yellowish-green, $\frac{1}{8}$ - $\frac{1}{4}$ in. diam. Sepals narrow, cuneate, puberulous. Petals shorter. *Drupe*s red, pisiform. Endocarp horse-shoe-shaped, sides excavated. Cotyledons elongate, flat, scarcely broader than the radicle.

Part used:—The root.

Use:—Roxburgh states that the acrid root is used medicinally in Sylhet, presumably for the same purpose as *S. hernandifolia*, Walp.

48. *Cissampelos Pareira*, Linn. H.F.B.I., I. 103.

Sansk.:—Laghu Pâṭhâ; Ambashṭhâ, Brihattikta (very pungent), Prachinambastika (Eastern Ambastika), Rasa (juicy), Varatikta (very pungent), Papanelil (creeper of sin), Sreysi (auspicious), Vridhakarnika (long-eared).

Vern.:—Kardhiyun-bâng (Poreb) Akanâdi; dakh, nirbisi, pâri harjeuri (H.); Akanadi, nemukâ (B. ; Tejo mulla (Santal); Batulpoti (Nepal); Katori, tikri, parbik, patâki, bat bel, Zakhmi haiyat, batindu pâth (*leaves*) pilijari, pilajur (root) (Pb.); Nirbisi (root) (Dek.); Venivel (Guj and Bomb.); Parayel (Goa); Po-mushtie, pun-mushtie; Pahadvel, pahadmul (Bomb.); Vâta tirupie (Tam.); Pata (Tel.). Padavali (Kan.). (Pari kuman) Pahre (Dûn). Diya-mitta (Sinhalese).

Habitat:—Tropical and sub-tropical India, from Sindh and the Panjab to Ceylon, up to 4,000 ft. In India ascending up to 6,000 ft. Cosmopolitan, common in the valleys of Simla and Dun.

A climbing, softly pubescent shrub. A lofty climber (Hk. and Th.), with herbaceous or slender woody branches, on a very short stout stem. Trimen says it is a woody twiner, usually of small size, with straggling branches, long shoots pubescent or tomentose. Wood brown, divided by very broad medullary rays and regular concentric bands of similar texture into small rectangular divisions, each with two to eight small to very large pores. The stem yields strong fibres, which are made into ropes. Leaves orbicular or broadly ovate, 1-4 in. across, peltate or cordate, obtuse and mucronate, rarely acute; base sometimes truncate. *Petiole* equalling the leaf, or longer. Flowers greenish-yellow, small. *Male flowers*:—on stalked branched cymes, clustered in leaf-axils, or borne on long axillary raceme-like shoots, each cyme in the axil of a small leaf-like bract. Sepals 4, hairy, ovate, spreading. *Petals* united into a shallow 4-lobed cup. *Stamens* 4, filaments united into a very short column, top dilated, peltate; anthers sessile round the margin. *Female flowers*:—clustered in axils of orbicular bracts crowded on long solitary racemes. Sepal one, pubescent, broadly ovate. Petal one, opposite the sepal, similar, but smaller and

deeply lobed; ovary 1, hairy, style shortly 3-fid. *Drupe* hairy, globose scarlet, $\frac{1}{2}$ inch diam. Endocarp transversely ridged and tuberculate. Seed horse-shoe-shaped.

Parts used:—The root, bark and leaves.

Uses:—Sanskrit writers consider the root to be light, bitter, astringent and useful in fever, diarrhœa, urinary diseases, dyspepsia, etc.

Ainslie writes:—"The leaves of this plant are considered by the *Vytians* as of a peculiarly cooling quality, but the root is the part most esteemed; it has an agreeable, bitterish taste, and is considered as a valuable stomachic. It is frequently prescribed in the later stages of the bowel complaints, in conjunction with aromatics." It is reported to be antilithic (Dymock).

"Used locally in cases of unhealthy sores and sinuses. Root given for pains in the stomach and for dyspepsia, diarrhœa, dropsy and cough; also for prolapsus uteri,—and applied externally in snake bite and scorpion sting." (Watt.)

It is officinal in the Pharmacopœia of India, where its medicinal properties are described as "mild tonic and diuretic exercising apparently an astringent and sedative action on the mucous membranes of the genito-urinary organs.

N. O. BERBERIDEÆ.

49. *Berberis vulgaris*, Linn. H.F.B.I., I. 109.

Vern.:—Zirishk; Kashinal; Chachâr or Chochar (Pb.); Bedana; Cutch (Pers.). Chatrod (Jaunsar).

Habitat:—Himalaya from Nepal westward, in shady forests, above 8,000 ft., Jaunsar and Tehri-Garhwal 12,000 ft., Simla, Narkunda, 8,000—12,000 ft, Tibet, Afghanishtan.

A small, deciduous, thorny shrub. Bark brown or grey, $\frac{1}{2}$ in. thick. Wood lemon-yellow, moderately hard, even-grained. Annual rings marked by an irregular belt of small pores, which are larger than those in the rest of the wood. Leaves 1-3 in. long, broadly ovate, or spathulate, membranous or thinly-coriaceous,

glaucous beneath, finely serrate, with equal spinulose teeth, crowded on arrested branchlets in the axils of the 3-fid, rarely 5-fid, or rarely simple spines. Petiole slender, $\frac{1}{10}$ -1 in. long. Racemes pedunculate. Flowers pale-yellow, stigmas broad, sessile. Berry ovoid, or cylindric, as long as, or shorter than the pedicel, usually red when ripe; edible.

Hooker and Thomson observe that this is an extremely variable plant. No less than five varieties are known.

Use:—In the Punjab, the drug is used as diuretic, and for relief of heat, thirst and nausea. It is astringent, refrigerant and antibilious. In small doses it is tonic, in larger cathartic. In the form of decoction, it is useful in scarlet fever and brain affections. (Watt).

50. *B. aristata*, D.C. H.F.B.I., I. 110.

Sansk.:—Dârvi, Dâru haridrâ, Pitadâru (yellow wood), Kata (The hip), Kateri (Having the bile), of bile, Suvarnavarna (Gold-coloured), Katankati (Growing on the hips).

Vern.:—Chitra; Chotra (Kumaon); dâr-hald; rasvat; Kashmal (H.); Sâmlû; Simlu; Kasmal; Chitra (Pb.); Chitra (Nepal); Tsema (Bhutia). 'Rasout' in India is the root-extract—Trimen.

Habitat:—Temperate Himalaya, from Bhotan to Kunawer, Nilghiri Mts., Ceylon, Jaunsar and Tehri-Garhwal, Simla. 6,000-9,000 ft.

Parts used:—The stem, root-bark, and fruit.

An erect spinous shrub, evergreen, 10-12 ft. high. Bark soft, light-brown, corky. Annual rings distinctly marked by a narrow belt of numerous pores. Pores small, in short, narrow wavy tails of light-coloured tissue. Branches shining, reddish-brown, slightly drooping. Leaves sessile, broadly lanceolate, more or less persistent, 2-3 in. long, obovate or oblanceolate, rather coriaceous, entire or with a few remote teeth, in the axil of 5-fid, trifid or a simple spine. The spine is here but a reduced leaf. *Flowers* bright, golden-yellow, in cymosely-branched racemes, drooping, much longer than the leaves. *Peduncle* 1-1½ in., long, red. Style short, but distinct. Stigma small, sub-globose.

Branches few-flowered. *Pedicels* $\frac{1}{5}$ - $\frac{2}{3}$ in. long, also red. Berries tapering into a very short style; oblong, ovoid, spindle-shaped, red. Young fruit cylindric.

Uses.—The medicinal extract from the root, known as *Rasot* is highly esteemed as a febrifuge and as a local application in eye diseases.

"Rusot is best given as a febrifuge in half drachm doses diffused through water, and repeated thrice, or still more frequently, daily. It occasions a feeling of agreeable warmth at the epigastrium, increases appetite, promotes digestion, and acts as a very gentle, but certain aperient. The skin is invariably moist during its operation.

"In over thirty cases of tertian ague (several complicated with spleen), we have succeeded in checking the fever, on an average, within three days, after commencing the rusot. In eight cases of quartan, six were cured. The cases of common quotidian, thus successfully treated, were so numerous that they were not recorded. In no instance was headache or constipation produced; but we have seen rusot exasperate the symptoms of chronic dysentery and hepatitis, when complicated with ague. (O'Shaughnessy.)

"Is taken internally in 5 to 15 grain doses, with butter in bleeding piles. Its solution, 1 drachm to 4 ozs. of water, is used as a wash for piles. Its ointment, made with camphor and butter, is applied to pimples and boils, being supposed to suppress them." (Dr. Penny, in "Watt's Dictionary of Economic Products." Vol. II., p. 446.)

"The wood, root-bark and extract of Indian Barberry have been used in Hindoo Medicine from a very remote period. Its properties are said to be analogous to those of turmeric. * * Indian Barberry and its extract, *rasot*, are regarded as alterative and deobstruent, and are used in skin diseases, menorrhagia, diarrhœa, jaundice, and above all in affections of the eyes. * * * Sârangdhara recommends a simple decoction of Indian barberry to be given, with the addition of honey in jaundice. In painful micturition from bilious or acrid urine, a decoction of Indian barberry and emblic myrobalan is given

with honey. A decoction of the root-bark is used as a wash for unhealthy ulcers, and is said to improve their appearance and promote cicatrization. * * *Rasot*, mixed with honey, is said to be an useful application to aphthous sores." (Dutt's *Materia Medica of the Hindus*).

50. *B. Lycium*, *Royle*, H.F.B.I., I. 10.

Vern. :—The same as those for *B. aristata*.

Habitat :—Western Himalaya, in dry, hot places, from Garhwal to Hazara, Jaunsar, Tehri and Garhwal, outer Himalayas 3-7,000 ft. Simla, 9,000 ft.

An erect rigid shrub. Bark white or pale grey. Branches angular. Leaves sessile or subsessile, tough, coriaceous, narrowly-lanceolate, obovate, oblong, sub-persistent, not lacunose, $1\frac{1}{2}$ - $2\frac{1}{2}$ by $\frac{1}{3}$ - $\frac{1}{2}$ in., inner ovate, very spinulose, or the teeth few and small or entire (Collett.); upper surface bright green, lower paler; venation lax. Racemes shortly stalked, simple or compound, longer than the leaves, often corymbose, drooping, barely longer than the leaves. *Flowers* pale yellow, stalks slender, $\frac{1}{2}$ in., style short, but distinct. Berry ovoid, violet, covered with bloom.

Part used :—The extract, known as *Rasout*.

Rasot or *Rasavanti*, used as an antidote against opium-habit, by Bhagwanlal Indrajī (Pandit J. Indrajī.)

Dr. Royle says:—"I have myself occasionally prescribed it, and the native mode of application makes it peculiarly eligible in cases succeeding acute inflammation, when the eye remains much swollen. The extract is, by native practitioners, in such cases rubbed into a proper consistence with a little water, sometimes with the addition of opium and alum, and applied in a thick layer over the swollen eyelids; the addition of a little oil I have found preferable, as preventing the too rapid desiccation. Patients generally express themselves as experiencing considerable relief from the application."

It is mentioned by the author of the *Periplus*, who lived about the first century, as an export from the Indies, and that

in the second century a duty was levied on it at the Roman custom-house of Alexandria; also that it was preserved in singular little jars which are now to be found in collections of Greek antiquities.

The fruit, which is of a beautiful purple colour and covered with a delicate bloom, is eatable, and is exported in a dried state.

Use:—The mode of preparation of the extract *Rasôt*, *Rasvanti* or *Rasânjan* is as follows:—Take 4 tolas of the Root cut into thin slices, boil it in half a seer of water, until reduced to a mass weighing 8 tolas; add to it eight tolas of goat's milk, and boil again into a solid mass. This mass is *Rasot*—(Dr. T. M. Shah of Junâgadh). The following powder is given as an effective remedy in dysenteric diarrhoea, in one dram doses. Take equal parts of *Rasot*, the bark and seeds. *Holorrhena antidysenterica*, (*kudâ*) the flowers of *Woodfordia floribunda* (*Dhaiti*), and the root-tube of *Aconitum heterophyllum* (*Atis*) and ginger, and reduce them to an impalpable powder (Dr. Shah).

Dr. Shah recommends *Rasot*, opium, alum and *Bâl-Hirda* (immature fruit of chebulic *Myrobalan*), rubbed on a stone, in equal parts, as an external application round inflamed eyes.

Mr. W. H. Lovegrove, Conservator of Forests, Jammu and Kashmir State, contributes an article on "*Rasaunt*" to *The Indian Forester* for May 1914 (pages 229-232), from which the following extracts are made:—

"*Rasaunt* is a brown extract prepared from the root and lower stem wood of *Berberies aristata*, *Berberies Lycium* and probably *Berberies asiatica* or *coriaria*. The *Berberis* is locally called *Kemlu*.

"In boiling out the product large quantities of green fuel are burnt. The common species used are *banj* (*Quercus incana*), *keint* (*Pyrus Pashia*), *kakoa* (*Flacourtia Ramontchi*), *kembla* (*Mallotus philippinensis*) and other broad leaves. Dry fuel is objected to as being more difficult to control in the kind of furnace used.

The roots of the *berberies* are dug up and after cutting off, say, the upper $\frac{1}{4}$ of the stem branches are well washed to remove all earth and foreign matter. They are then cut up into small pieces, the smaller the better. In the *Basantgarh Range* the sizes of the chips are about $1\frac{1}{2}$ " or 2 " \times $\frac{1}{2}$ " or $\frac{1}{4}$ ", but in the *Basohli Tahsil* (which prides itself on producing a better quality *Rasaunt*) the pieces are much smaller.

The chips are then put into earthen pots, in the proportion of 3 seers of chips to 5 seers of water, the pots being roughly 1' high 7" diameter.

These pots are then placed in two parallel rows on the top of a long furnace, the pots being sealed with clay into the small holes left on the top of the furnace for their reception, thus closing all cracks to the draught and distributing the heat from the fire evenly throughout the flume of the furnace.

The boiling goes on for about six hours. As water evaporates fresh water is poured in so as to keep the chips always well covered. At the end of this period the contents of pot 2 are poured into the practically empty pot 1, the contents of pot 3 into pot 2 and so on. This is not done quickly but leisurely and water added to rinse the chips. Where the iron pan is used, the extract is poured into that instead of into pot 1.

In this way the liquid contents of all the pots eventually finds its way to pot 1 on each row, or into the iron pan where it is still further evaporated until sufficiently concentrated. It is not known how long this takes, but apparently there is no hurry about it, and it may stand for some days or for a few hours. When ready it is of the consistency of a thick treacle, and is poured out into small receptacles made of the leaves of *belangor* (*Bauhinia Vahlii*) where it cools and thickens; eventually being packed into baskets for transport to Amritsar.

The larger part of the 'resaunt' extract appears to be exported from Amritsar to Multan, whence it probably extends to Sindh and other desert tracts. Its use is largely in mixing with drinking water. What its effect on the water is, is not known to the writer at present, but its presence probably neutralises a salt, as it is said to make the water "cooler."

51. *B. asiatica*, Roxb. H.F.B.I., I. 110. Roxb. 300.

Habitat:—Dry valleys of the Himalaya, from Bhutan to Garhwal, Behar, on Parasnath, Lower hills Dehra.

Vern.:—Kilmora (Kumaon); Kingora (Dehra Dun and Garhwal); Mâte-Kissi; Chitra (Nepal), Kishornoi (Jaunsar).

Uses:—The medicinal uses of this are the same as those of *B. aristata*.

An erect thorny shrub, 3-6 ft. Bark soft, pale, light brown, yellow in bast layers, corky outside, and deeply cleft vertically. Wood yellow, hard Easily recognized by its net-veined leaves. The arrested leaf-bearing shoots often on the top of stout woody tuberculate branchlets of previous years. Leaves 1-3 in., rarely acute, rigidly coriaceous, white beneath, obovate, sometimes nearly orbicular, nerves and veins strongly reticulate, laciniöse

between the veins. Seedlings have broadly-ovate leaves, petiole slender, more than twice the length of the blade (Brandis). Usually the leaves, says Kanjilal, are with large distant spinous teeth. Racemes corymbose, dense-flowered, shorter than the leaves. *Flowers* peduncled or sessile, 2 in. diam., pale-yellow, at times only $\frac{1}{12}$ - $\frac{1}{2}$ in. diam. *Stigma* capitate on a distinct style. Berries large, $\frac{1}{2}$ in. long, ovoid, often nearly globose, glaucous red or black; edible.

52. *Podophyllum Emodi*, Wall. H.F.B.I. I. 112.

Sanskrit—Laghu Pâttrâ.

Vern.:—Pâpra, pâpri, bhavan-bakra, bakra-chimyaka, Nirbishi, Pilijadi (H.); Papri, ban-kakri; banbakri, Kâkra, ban-kâkra, Chimyaka, Chijâkri, gul-kakri, wan-wângan (Pb.). Veni-wel (Guj.); Pâd wel (Mar.).

Habitat:—Interior ranges of the Himalaya, from Sikkim to Hazara; Kashmir. Simla, Jaunsar and Tehri Garhwal, 7,000, ft.

A scapigerous herb. Stem or scape 6-12 in., erect, stout, herbaceous. Leaves 2, vernal, alternate, long-petioled, plaited and deflexed in venation, 6-10 in. diam., orbicular, 3-5-lobed to the middle or base; lobes cuneate, laciniate or acutely serrate. Peduncle terminal in bud, then apparently supra-axillary or inserted on the petiole of the upper leaf. Flowers white or light rose, 1-1 $\frac{1}{2}$ in. diam., cup-shaped. Sepals very deciduous. Petals 6, sometimes 4 (Royle), ovate-oblong. Stamens usually six. Anther-cells opening by slits. Ovary simple. Stigma large, sessile, peltate. Berry 1-12 in., ellipsoid, red, edible. Seeds many, obovoid, imbedded in pulp, on a broad ventral placenta.

In the *Indian Forester* for October 1915, Mr. R. S. Troup, I. F. S., has contributed a note on the cultivation of *Podophyllum Emodi*. According to him the plant can be cultivated easily from seed or from pieces of rhizome, but owing to the very slow growth of the rhizomes it is by no means certain to what

extent the plant can be cultivated with profit. He has summarized the following facts from his experiments :—

- (1) that *Podophyllum* can be grown successfully either from seed or from sections of rhizomes of any size down to under $\frac{1}{4}$ in. in length, though perhaps this length should be taken as a minimum ;
- (2) that in either case transplanting can be carried out without danger, though in the case of planting rhizome cuttings it is preferable to plant direct in the forest and not to transplant from nursery beds ;
- (3) that the development of rhizomes is extremely slow : in the case of plants raised from rhizome cuttings it may possibly take at least 12 years to produce fair sized marketable rhizomes, while in the case of seedling plants the period is likely to be longer.

Mr. Puran Singh, F.C.S., Chemist at the Forest Research Institute, Dehra Dun, in a note on the Resin-value of *Podophyllum Emodi* and the best season for collecting it, writes :—

"The rhizome should apparently be collected in May about the time when the plant is in flower and not in the autumn as has been suggested.

The Comparative Value of the Indian and the American Drugs.

"It has been admitted that the Indian plant is richer in resin as well as in Podophyllotoxin than the American. From the results of the assay of American *Podophyllum* given by Dunstan and Henry it is calculated that the percentage of the active principle in the resin of the American plant ranges from 15.29 to 23.74. According to the analysis of a sample of the American drug by Umney, the active principle amounts to 22.9 per cent. of the resin. In a sample of the Indian drug examined by him, in 1892, he found 25 per cent., while in another sample collected after fruiting in 1910, he found 50.3 per cent. The percentage of Podophyllotoxin in the Indian resin varies according to the season of collection from 25 to 50 per cent., and it is safe to assert that an average quality of the Indian plant will contain as a rule twice as much of the active principle as the American."

Part used :—The root.

Use :—"Half a grain of the resin, mixed with a little sugar, produced unmistakable cathartic effects in the course of a few hours. * * As there is such a great resemblance between the Indian and the American species of *Podophyllum* in their botanical and technical characters, and as the former yields such a large quantity as 10 to 12 per cent of an active principle, it is desirable that attention be drawn to such a promising and useful medicinal agent." (Dymock and Hooper in the *Ph J.* for Jan. 26th, 1889, p. 585.)

Chemistry.—

The constituents of *P. Emodi* are identical with those of *P. Peltatum*. Crystalline podophyllotoxin $C_{15}H_{14}O_6 \cdot 2H_2O$, when acted on by aqueous alkalis, is converted into the isomeric pieropodophyllin. The formula of podophyllic acid is $C_{15}H_{16}O_7$. There is also a yellow coloring matter $C_{15}H_{10}O_7$, which is identical with the quercetin.

Podophyllo-resin has the formula $C_{12}H_{12}O_4$.

Podophyllin is as valuable a purgative as the podophyllin obtained from *P. peltatum*. The action of this resinous mixture is due partly to the podophyllotoxin it contains, and partly to the active podophyllo-resin. Owing to its intensely irritating action internally, even when given in small doses, podophyllotoxin is unsuitable as a medicinal substitute for podophyllin, whilst podophyllo-resin would seem to present no therapeutic advantage as compared with the podophyllin now employed. Pieropodophyllin, pieropodophyllic acid, and the quercetin are very slightly, if at all, active as purgatives. Since *P. Emodi* furnishes more podophyllin than *P. peltatum*, the Indian plant is of greater value as the source of this resin.—J. Ch. S. T. 1898, p. 209.

N. O. NYMPHÆCEÆ.

53. *Nymphaea alba*, Linn. H.F.B.I. I. 114.

Vern.:—Brimposh, nilofar; Kamud; (Kashmir). Pāndharén Kamal (Bombay).

Habitat:—Kashmir lake, alt. 5,300 ft. Bombay tanks and wayside still water-courses.

An aquatic creeper. Root-stock creeping under water. Leaves floating on water-surface, cordate, quite entire, 5-10 in. diam., suborbiculate, lobes contiguous. *Flowers* a foot or 6 in. above water, white on a green peduncle, expanding at sunrise and closing at sunset. *Sepals* 4 linear or ovate-oblong; nerves reticulate. *Petals* 10, outer linear-oblong, equalling the sepals. *Anthers* without appendages. *Stigmatic rays* about 16, with cylindric appendages. *Pollen* echinate. *Seeds* minute, numerous, buried in a mucilaginous pulp, edible. *Fruit*, a spongy berry, opening under water.

Parts used:—The Root-stock, flowers and fruit.

Uses:—The mucilaginous and somewhat acrid root and stock are administered in some countries for dysentery. According to O'Shaughnessy it is astringent and slightly narcotic. Its flowers are reputed to be anti-aphrodisiac. An infusion of the flower and fruit is given in diarrhoea and as a diaphoretic. (Stewart).

54. *N. Lotus*, Linn. H. F.B.I. I. 114.

Syn. :—*N. rubra*, Roxb. *N. edulis*, DC.

Habitat :—Common throughout the warmer parts of India, abundant in Bombay, Thana district, Ceylon streams, tanks, ponds, up to 1,000 ft.

Sansk. :—Raktotpala (Red lotus), Kokonada (Lotus), Hallaka (Red lotus), Raktasandhika (Red joints), Nilotpala (Blue lotus), Kunalaya (Lotus), Bhadra (Auspicious), Indivara (Good lotus).

Vern. :—Kanval; Chota Kanval (H.); Shāluk; Saluk; nal; Koi (parched seeds); rakta kamal (red variety); Chota sundi (B.); Dhaala-Lain; rangkain (Orissa); Kuni; puni; lorhi (root); napo (seeds) (Sind); Alli-phul (Dec.); Kanval; Kanval; nilophal (Guz.); Lāla Kamal, Rakta Kamal (Marathi); Alli-tāmarai, Ambal (Tam.); Alli-tāmara; tella-kaluva; koteka; Erra-kaluva (red var.); Kalha-ramu (Tel.); Nyadale-huvu (Kan.); Ampala (Malay); Otu-Et-Olu (Sinhalese).—

Parts used :—The flowers, root and seeds.

N.B. :—Trimen observes thus :—The colour of the flowers varies from pale pink or nearly white to a deep rich rose-colour. Their size is also very variable; but these differences are not united with any structural ones of sufficient importance to distinguish separate species.

An aquatic creeping herb. Rootstock short, erect, roundish, tuberous. Leaves on very long, erect, cylindrical, submerged petioles. Blade horizontal, floating, peltate 6-8 in. diam., sagittate-rotundate, very obtuse, with a narrow or wide sinus 3 in. deep at base, coarsely and sharply sinuate-dentate, smooth above, more or less densely and finely velvet-tomentose beneath, with veins very prominent. *Flowers* solitary, very large, 5-7 in. diam., on very long, usually pubescent, peduncles. *Sepals* oblong, obtuse, ribbed, glabrous or pilose externally. *Petals* about 12, oblong or oval-oblong, obtuse, spreading. *Stamens* about 40, anthers without appendages, filaments dilated at base. Rays of stigma terminating in fleshy, club-shaped, incurved appendages. *Fruit* 1½ in. diam., globular, fleshy, green, crowned with erect connivent, stiff, persistent sepals. Cells

about 15, closely crowded with seeds. Seeds ovoid-globular, ribbed with vertical lines of little tubercles, and very minutely transversely striate; aril white, transparent. Seeds edible.

The flowers are sweet-scented. They sink under water to mature and ripen.

Uses:—The rootstock of this plant, says my old friend, Pandit Jaya Krishna Indraji, at page 16 of his *Vanaspati-Varnana* (Gujrati), is used on fast days by Hindus as a nourishing article of food, after boiling and mixing it with milk and sugar. The powdered rootstock is also given in dyspepsia, diarrhoea and piles. A decoction of flowers is also given in palpitation of heart, it is not stated in what quantity or of what strength.

55. *N. stellatta*, Willd. H. F. BR. I., I. 114.

Sanskrit:—Nilôtpal, Indivar.

Vern.:—(Sinhalese) Monch; (Porebunder) Kamal, Kâlâ Kamal, Kûmdû; (Guj.) Nilkamal; (Mar.) Poyani, Krishna-Kamal. (Hindi) Nil-padma, Lilophal, Nil-kamal.

Habitat:—Common throughout the warmer parts of India and Ceylon, in shallow streams, tanks and ponds. Open all day, says Trimen. But some of the pale blue and drab-coloured varieties in Ratnagiri and Thana (Konkan) open at sunset and close at sunrise. They are found in tropical and Northern Africa. Trimen notes a violet-coloured variety from Ceylon, also pinkish-purple.

Rootstock ovoid, short, erect; leaves on long, rather slender, submerged petioles; blade floating; about 5-8 in. diam., sagittate-rotund, very obtuse, with a usually narrow sinus, 2-3 in. deep at base, entire or coarsely sinuate, glabrous on both sides. *Flowers* solitary on long peduncles, 3-6 in. diam., sepals narrowly oblong-lanceolate, acute or subacute. *Petals* linear-lanceolate, acute or subobtuse. *Stamens* 40-50, with a tongue-shaped appendage beyond the anthers. Stigmatic rays acute, 10-30, curved upwards at the ends, without appendages, in short horns. *Fruit* globular. *Seeds* longitudinally striate. *Flowers* throughout the year.

Uses:—Its uses are those of *N. Lotus*. Roots and seeds edible, especially in famines.

56. *Euryale ferox*, Salisb. H.F.B.I., I. 115.

Habitat:—Sweet water lakes and ponds of East Bengal, Assam, Manipur, Oudh and Kashmir.

Sansk. Mukhâuna; padma.

Vern.:—Makhana (H & B); Kunta padma (Uriya); Jewar (Pb.); Melluni padman (Tel).

A densely prickly aquatic. Rootstock short. Leaves peltate, corrugate, 1-4 ft. diam., elliptic or orbicular, green above, downy, deep bluish-purple beneath (Curtis Pl. 1447), with strong spiny ribs. Spines sharp-curved on the under and upper surfaces. Ribs dichotomously branched over the whole leaf. The leaf, while in bud, is curiously folded up and enclosed in an involucre, which bursts as the leaf expands. *Petiole* long, wavy, spiny. *Flowers* 1-2 in. long, bright-red inside, green and shining outside. *Sepals* 4, erect, inserted on the edge of the torus above the carpels. *Petals* numerous, violet, 3-5-seriate, shorter than the sepals. *Stamens* many, many-seriate, fascicled in eights; filaments linear, pollen spherical, 3-nucleate. *Ovary* 8-celled, sunk in the dilated top of the torus. Stigma sessile; discoid, concave. Berry spongy, 2-4 in. diam., crowned with persistent sepals. Seeds 8-20, from a pea to a cherry in size, much eaten roasted. Aril pulpy. Testa thick, black. Albumen mealy; embryo small.

Use:—The seed is considered as possessed of powerful medicinal virtues, such as restraining seminal gleet, invigorating the system, &c. (Roxburgh).

A light and invigorating food, suited for the sick (U. C. Dutt).

57. *Nelumbium speciosum*, Willd. H. F. B. I., I. 116. Roxb. 450.

Sansk.:—Kamala (A lotus), sweta (white), Ambhoja (born from water), saraja (born from a lake), sarsiruha (growing in a lake), sahasrapatra (Thousand-leaved), srigheha (Abode of beauty), satapatra (Hundred-leaved), Pankeruha (growing in mud), Tamarasai (copper colour), Rajina (Lotus), Push-

karavali (Pushkara-named), Abja (born from water), Ambhoruha (born from water), Padma (A lotus), Pundarika (A lotus), Pankaja (born from mud), Nala (Lotus), Nalina (Lotus), Arvinda (Lotus), Mahotpala (great lotus).

Vern.:—Kanwal (H.) (Kumaon), Padma (B.); Padam (Uriya); Besenda, Pabbin (N.-W. P.); Pamposh; Kanwal Kakri and bhe or phe (root), gatte (Seed) (Pb.); Pabban (plant), bhe root, Paduro (Seeds), Nilofar (drug) (Sind); Kungwelka-gudda (Dec.); Kamala-Kankadi (Bomb.); Tavarigadde; tavaribija (Kan.); Paud-Kanda (Poona); Shivapdutamara-ver, ambal (Tam.); Erra-tamara veru (Tel.); Tamara (Malay.). Tamarai (Tam.) Ceylon; Nelun (Sinhalese).

Habitat:—Throughout India, extending as far to the N. W.P. as Cashmir. Abundant in Bombay, Thana district, Ceylon, Persia, China, Japan, Malay Islands, Tropical Australia.

An erect, large herb of still waters, extensively creeping. Root-stock stout, creeping. *Leaves* raised several feet high above water; peltate, 2-3 ft. diam., membranous glaucous, cupped. *Flowers* magnificent, rose-red or white, sweet-scented, 4-10 in. diam. *Peduncles* and petioles 3-6 ft. high, full of spiral vessels, with stumpy, scattered prickles. *Sepals* 4-5, inserted on the top of the scape, caducous. *Petals* and stamens many, hypogynous, many-seriate, caducous, elliptic, concave, veined. Anthers adnate, with a clubbed appendage, produced beyond the anther-cells. *Ovaries* many, 1-celled, loose, sunk in a flat top of an obconic, spongy torus (not fleshy torus). The torus or receptacle 3-4 in. high, flat at top, 2-4 in. wide. Style short, exserted; stigma capitate. Ripe carpel, seed-like, $\frac{1}{2}$ in. long, ovoid, glabrous. This is fruit and seed at one and the same time; edible. Pericarp black, bony, smooth. Albumen absent, cotyledons fleshy, thick, enclosing the large green folded plumule. Testa spongy brown.

Hermann gives Nelumbo as the Singhalese name (Trimen).

In Sanskrit, the white variety is called Pundarik; the pink is called Kokonad, and the blue variety is called Indivara. I have never come across this third blue variety in the Konkan or the

Dekkan, but it has been mentioned by Pandit Jaya Krishna Indrajī and Dr. Tribhuvandas M. Shah, in their respective works. The flowers of *Nelumbium speciosum* open at sunrise and close at sunset. Hence, they are called *Sūrya-vikāshī* or *Sūrya-Kamal*; whereas *Nymphœa stellata* opens at sunset and closes at sunrise, and is hence called *Chandra-vikāshī* (K. R. K.)

N.B.—It is the 'Lotus' of the Europeans in the East; the *Oyamus* or 'Sacred Bean' of ancient Egypt, where it does not grow now (Trimen).

Parts used:—The filaments, seeds, leaves, and root.

Uses:—By Sanskrit authors, the filaments are considered astringent and cooling, useful in burning sensation of the body, bleeding piles and menorrhagia. In bleeding piles, the filaments of the lotus are given, with honey and fresh butter, or with sugar.

The large leaves are used as cool bedsheets, in high fever, with much heat and burning of the skin (Dutt's *Materia Medica* of the Hindus). The seeds are used to check vomiting, and given to children as diuretic and refrigerant. The milky viscid juice of the leaf and flower stalks is used in diarrhœa. The petals are said to be slightly astringent.

The large root stalks are cut into 1 foot pieces, and sold under the name of *Bhishi*; they afford a cooling, refreshing dish, when cooked in milk or cocoanut juice, with salt or sugar.

A sherbet of this plant is used as refrigerant in small-pox, and is said to stop eruption; used also in all eruptive fevers. The root is used as a paste in ringworm and other cutaneous affections. (Dr. Emerson.)

The flowers are used as an astringent in diarrhœa, also cholera, in fever and diseases of the liver; and are also recommended as a cardiac tonic.

The powdered root is prescribed for piles as a demulcent; also for dysentery and dyspepsia.

The seeds form a cooling medicine for cutaneous diseases and leprosy, and are considered an antidote for poisons.

N. O. PAPAVERACEÆ.

58. *Papaver Rhæas*, Linn. H.F.B.I., I. 117.

Vern.:—Lāla, lāl-postā (H.); Lāl poshta, Lāl-poshter-gāchh (B.); jungli-Mudrika (Bomb.); Tambadya-Khasa-Khesa-che jhāda (M.); Lālā; lāl-khas-khas-nu-jhada (Guz.); Lal Khas-Khas-ka-jhar (Dec.); Shivappu-gasha-gasha-chedi; Shigappu-postaka-chedi (Tam.); Erra-gassa-gasala chethe; Erra posta-Kaya chethe (Tel.); Kempu-Khasa Khasa Gida (Kan.); Chovanna Kasha-Kashach-cheti (Malay.).

Habitat:—Kashmir.

An annual herb, with a milky juice; branched, hispid, 1-2 ft. high. Leaves 1-2-pinnatifid; leaf-lobes more or less cut, ascending, awned. Scapes with spreading and adpressed hairs. *Flowers* scarlet, 3-4 in. diam. *Sepals* hairy above. Pairs of petal unequal; filaments filiform. Stigmatic rays overlapping, i. e., reaching or exceeding the edge of the disk. *Capsule* stalked, subglobose glabrous.

Parts used:—The capsules.

Use:—The milk from the capsules is narcotic and has slightly sedative properties. (Watt).

59. *P. dubium* Linn. H.F.B.I., I. 117.

Habitat:—Western Himalaya, from Garhwal to Hazara, in cornfields. Simla 4,000-7,000 ft., W. Asia, Europe.

It resembles *P. rhæas*, but often glabrous, and leaf segments usually narrower; hairs of scape appressed. *Petals* scarlet, in unequal pairs. *Capsule* sessile.

An alkaloid has been extracted from it.

By extraction of the seed capsules of *Papaver dubium* with light petroleum, a previously unknown alkaloid, aporeine, is obtained. The thick, yellow, amorphous extractive product amounting to 0.015 p. c., yields with 10 p. c. hydrochloric acid, the hydrochloride, which forms glistening scales, melting at about 230°, and gives precipitates with silver nitrate and phosphomolybdic acid. The base forms microscopic leaflets after crystallisation from ether, light petroleum, or chloroform. When a solution of the trace of the alkaloid or its hydrochloride in a drop of nitric acid of sp. gr. 1.3 is dropped into concentrated sulphuric acid, a violet, brown, and finally yellow

coloration is produced, a similar result being given by the base with strong sulphuric acid in which a crystal of potassium chlorate has been dissolved. The hydrochloride gives a greyish-blue, green, brown, and finally black coloration, with a solution of 2 or 3 drops of 40 per cent. formalin in 3 C. C. of concentrated sulphuric acid; with strong sulphuric acid, especially in the presence of potassium nitrate, or with fuming nitric and sulphuric acids in the presence of potassium dichromate, a brown coloration.

The hydrochloride produces on the tongue at first a burning and then a numbing sensation. The alkaloid is a tetanus poison, similar to thebaine—(J. Ch. S. LXXXVIII, part I., p. 363).

60. *P. somniferum*, Linn. H.F.B.I., I. 117. Roxb. Fl. Ind. II. 571.

Sans. :—Apoka (Apium), Ahiphena (foam of a serpent); Saphenaka (foamy).

Vern. :—Nabatul-khash-khash (Arab); Koknâr (Pers.); Post, khaskhas-kâ per (Hind.); Khash-khash-ka-jhar (Dec.); Gasha gashâ-chedi, postaka chedi (Tam.); Gasagasâla-chettu, postakaya-chettu (Tel.); Kasha-kashach-cheti (Mal.); Khasa-khasigida (Kan); Poshta, poshtâr-gâchh, afimâ (Beng.); Khasa-khasa-chen jhâda (Mar.); Khas khasnu-jhâda (Guz.); Bhinbin, bh-ain-bin (Burm); Khasakhasi-chenjhâda (Bom.).

An annual herb, with a milky juice; rarely branched, 2-4 ft., glaucous, simple, usually quite glabrous. Leaves oblong, amplexicaul, lobed, toothed and serrate, sometimes ovate-oblong or linear-oblong. *Flowers* large white, on long peduncles, purple or scarlet. *Sepals* glabrous. Filaments slightly dilated. Ovary one-celled. Stigma discoid, with radiating lobes opposite the placentas which project into the cell. Capsule 1 in. diam., stalked, globose, glabrous, stigmatic rays 5-12, persistent, have each a small valve under the lobes, through which the innumerable, fine, white, delicious, oily seeds escape. There are black seeds also, say Hooker f. and Thom., but I have never seen them on this side of India.

Cultivated throughout India. The largest quantity comes to Bombay from Malwa.

Use :—The medicinal properties and therapeutic uses of opium and its preparations are too well-known to be described here.

Chemistry.—

1. The seeds are alkaloid-free.
2. The alkaloids may be detected in minute quantity in seedlings, after about 14 days' growth.
3. From this point until the seeds begin to store albumin, an increase in alkaloidal content takes place.
4. This increase is not constant, but varies with the intensity of illumination, under which the plant develops, long periods of overcast sky sufficing to reduce the alkaloid content to a minimum.
5. As the seeds ripen, the alkaloid content decreases.
6. During the ripening of the seeds, the alkaloids are gradually consumed by the plant in effecting albumin synthesis and cannot, therefore, be regarded as products of excretion.
7. It is probable that the decrease in alkaloid content, during cloudy weather noted under (4), is due to similar causes, namely, alkaloid consumption by the plant for albumin synthesis during failing light.

(Chemical Abstracts, Jan. 10, 1915, p. 94.)

Formation and distribution of certain alkaloids in it.

The alkaloids appear in the following order, narcotine, codeine, morphine, papaverine, thebaine, the first four being found when the plant is only 5-7 cm. high. The flowering plant, up till the time of ripening, contains narcotine, papaverine, codeine, and morphine in all its organs, with the exception of the hairs. The latex varies in composition in different parts of the plant. Narcotine, codeine and morphine are found in all the organs of the ripe plant. Narcotine is produced—from the albumin of the seeds, and is found in seeds which have germinated in nitrogen-free soil. This alkaloid is present in moderate amount in very young plants; the quantity is much greater in the flower-heads than in the unripe seed-capsules. J. Ch. I. 31. 12, 1910, p. 1471.

It is known that opium is more active therapeutically than its morphine content would indicate. Experiments are now described, indicating that this is due to the narcotine contained in the opium. The effect is not of an additive character, but apparently the narcotine strengthens the narcotic and tonic action of the morphine and lessens the injurious action of the latter on the respiratory centre. The most effective mixture appears to be one of equimolecular quantities of the two alkaloids. J. Ch. I. 31. 7. 1912, p. 700.

61. *P. Orientale*, Linn. H.F.B.I., I. 117.

Cultivated in Gardens.

Two alkaloids, thebaine and isothebaine, have been isolated. During May and June, the period of most rapid growth, thebaine is largely produced, while isothebaine is found mainly in the root during late fall, and after ripening and drying of the aerial plant.

The Secondary Alkaloids.

The amorphous basic mixture, obtained after the separation of thebaine and isothebaine, contains 2 alkaloids without, and at least 3 with phenolic properties.

(Chemical Abstracts for February 10, 1915, pp. 298-300.)

The non-phenolic alkaloids consist of protopine, m. pt. 204°-205°C. and an amorphous alkaloid very soluble in organic solvents, whilst the phenolic alkaloids consist of a new alkaloid, *glucidine*, m. pt. about 238°-239°C., (a) D about + 47 to + 54°, giving color reactions similar to, and apparently closely related to, glaucine, and a mixture of amorphous alkaloids too small in amount to separate and characterise—J. Ch. I. for October 31, 1914, p. 1026.

62. *Argemone mexicana*, Linn. H.F.B.I., I. 117.
Roxb. 426.

Engl. :—The Mexican or Prickly Poppy.

Sanskrit :—Srigāla-Kāntā; brahmadandi.

Vern. :—Bharbhand, pilādhuturā, farangi-dhuturā, ujar-Kāntā Shiāl-kāntā, sial-kanta (H.); Baro-Shial kanta (B.); Gokuhla jānum (Santal); Bharbhurwa, Karwah kantela (N.-W. P.); Kandiāri, Siālkāntā bhatmil, Satyanasa, bherband, Katci, bhatkateya (Pb.); Farangi dhatura, bharamdandi, dāruri, pilādhuturā (Dack.); Dārudi (Guj.); Firangidhotra, dāruri, pinvalādhotrā, kante-dhotra (Mar.); Birama-dandu, Kurukkum-Chedi, (Tam.); Brahma dandi-chettu (Tel.); Datturi, datturi-gidda (Kan.); Brahma-danti (Mal.); Kanta-kusham (Uriya).

Habitat :—By roadside and Simla 5,000 ft., in fields throughout India.

An erect, prickly, robust annual herb, with copious yellow juice and rigid prickles, growing wild in rich roadside places and rice-fields, after the crops of rice-plants are cut down; stem sometimes half-woody below, 2-4 ft., with spreading branches. Leaves 3-7 in., amplexicaul, glaucous-green, blotched with white, deeply repand, sinuate, pinnatifid, with thorny teeth. Peduncles erect, both before and after flowering. *Flowers* yellow, scentless 1-3 in. diam. Calyx glabrous and prickly; sepals horned at the top. Petals 4-6; stamens numerous. *Stigmas* 4-5, radiating free, red. *Capsules* $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, terete, prickly, 4-5-valved; obovate, or elliptic-oblong, 1-celled; opening by valves at the apex. Seeds spherical, shining, black, pitted.

Parts used :—The seeds, and roots.

Uses :—The yellow juice of this plant is used as a medicine for dropsy, jaundice, and cutaneous affections. It is also diuretic, relieves blisters, and heals excoriations and indolent ulcers. (Watt). The seeds yield on expression a fixed oil, which has long been in use amongst West India practitioners as an aperient. The unfavorable report of Sir W. O'Shaughnessy (*Bengal Disp.*, p. 183) led to its being neglected; but more recent trials of its properties by several medical officers in Bengal serve to prove that in half drachm doses it acts as a gentle aperient, and at the same time allays, apparently by a sedative action, the pain in colic. The smallness of the doses, and the mildness of its operation are recommendations to its employment. Age apparently affects its activity, the freshly prepared oil proving more energetic and uniform in operation than that which has been long on hand. Applied to herpetic and other forms of skin disease, it is reported to exercise a well-marked soothing influence, according to Dr. Bonavia and others (*Indian Med. Gaz.* 1866, vol. i., p. 206). As a local application to indolent and ill-conditioned ulcers, the expressed yellow glutinous juice of the plant is held in much esteem by the natives. Dr. W. Dymock, of Bombay reports having used it thus with good effect. The native practice of applying this juice to the eye in ophthalmia is dangerous. Both in a chemical and therapeutical point of view, this plant appears worthy of investigation. (Ph. Ind.).

“The seeds are laxative, emetic, nauseant, expectorant and demulcent; the oil, a drastic purgative, nauseant and expectorant; and the root, an alterative tonic. The seeds and oil have also a beneficial effect over asthma.

“The seeds are useful in cough and catarrhal affections of the throat and pulmonary mucous membrane, and in pertussis and asthma. Though they do not appear to possess any antispasmodic property, they have a distinct control over asthma, apparently, from their combined actions of nauseant, emetic, expectorant and demulcent. As their use is often accompanied by more or less vomiting and nausea, they are more suited

as a laxative medicine to some pulmonary affections than other diseases. The oil is serviceable in some cases in which jalap, rhubarb and castor-oil are indicated, and also in some bronchial and catarrhal affections. The use of the root is attended with benefit in some chronic cases of skin diseases.

"There is a great difference in opinion as to the action and dose of the oil of *Argemone Mexicana*. Some say that thirty minims of it act as an efficient cathartic, while others consider it to be quite inert and incapable of producing any purgative effect in "ounce doses." I have got this oil prepared three or four times in my own presence, and tried it in many cases. The former opinion is quite correct, and with regard to the latter, it is necessary to say that the oil, so far from being inert in "ounce doses," is unsafe in more than forty minim doses, and produces a dangerous hypercatharsis when the dose is increased to one drachm. If the oil is fresh, its average dose is twenty-five minims; and, if old, thirty-five. It is a good drastic or hydragogue cathartic in such doses, and generally produces from 5 to 12 motions. Its advantage over jalap, rhubarb, castor-oil, &c., is the smallness of its doses; and over the croton oil, its freeness from unpleasant, nauseous and acrid taste. Its disadvantages as a purgative are, firstly, that its action is not uniform even in its average dose which produces more than fifteen or sixteen motions at one time, and only three or four at another; and, secondly, that it is generally accompanied by vomiting at the commencement of its operation. Though the latter is not severe, yet it has a very unpleasant effect in a purgative medicine. Hypercatharsis from the use of this oil is not generally attended with great debility and other dangerous symptoms, frequently observed under a similar condition from croton oil and some other purgatives." (Moodeen Sheriff's *Materia Medica of Madras*).

In the Concan, the juice with milk is given in leprosy. * * * An extract made from the whole plant has been found to have an aperient action, and the milky juice to promote the healing of indolent ulcers. I have not noticed any bad effects from its application to the eyes. Its use as an external application to the eyelids in conjunctivitis was probably introduced into

this country by the Portugese, who appear to have adopted it in Brazil as a substitute for the Argemone of the Greeks and Romans which was used for a similar purpose (Dymock).

"The yellow juice mixed with *Ghi* is given internally in gonorrhœa (D. R. Thompson, M.D., C.I.E.)"

"I found the juice very useful in scabies. Asst.-Surgeon Gowry Coomar Mukerji found the powdered root in drachm doses useful in tapeworm (R. L. Dutt, M.D.)"—Watt's Dictionary.

The smoke of the seeds is used in Delhi to relieve tooth-ache. It is also said to be useful in caries of the teeth.

The seeds are used as a purgative in syphilis.

In leprosy it is used as follows:—

One tola of the juice, early in the morning, taken on empty stomach.

It is said to cure leprosy in 40 days.

"The juice is useful in malarious fevers of a low chronic type. How it acts I am not sure, but I believe it has some specific effect (germicidal) on the malarial parasites and, secondly, it acts probably as a purgative.

"I have only tried this juice in a few cases—about six or seven cases—and it only acted well in one or two cases; so I cannot speak with confidence.

"I believe the oil is a better preparation than the juice, which is an unstable compound.

"I am certain also the oil is a powerful alterative in syphilis and leprosy, the same as Neem oil, but I have not used it yet for this purpose.

"This drug has only lately come to my notice, and I believe there is a great future before it (Major D. B. Spencer, I. M. S.)

Chemistry.—

Charbonnier claimed to have isolated morphine, and his statement was confirmed by Ortega. Peckolt, however, concluded that the plant contained a new alkaloid, *argemonine*, and not morphine.

To determine this question, Mr. J. O. Schlotterbeck exhausted a large quantity of the dried plant, with chloroform, and obtained a large yield of berberine, whilst a second alkaloid, identified as protopine, was extracted with ether from the filtrate.

In Schlotterbeck's opinion, protopine was the substance regarded as morphine by Charbonnier, and as a new alkaloid by Peckolt.

Potassium nitrate was identified among the salts naturally existing in the plant. J. S. Ch. I, April 31, 1902, p. 560.

Some crushed seeds were steam-distilled by K. Bhaduri of Calcutta. The distillate had a slight opalescence and a very pungent odour, but no oil came over. Extraction of the crushed seeds with petroleum-ether gave 22.3% of a pale greenish yellow oil with a green fluorescence. The oil obtained by pressing the crushed seeds was deep brown, mild odour, tasteless, d_{25} 0.9117, d_{100} 0.9007, n_D^{32} 1.4334, sapon. no. 185.5, acetyl no. 27.9, acid no. 146, I. no. 106.7, R.-M. no. 0.61, Hehner no. 94.02, glycerol 15.48%, Maumene test 65°. The oil, very thin at first, gradually thickens on keeping. AcOH and valeric acid are present. The mixed fatty acids, pale in color and thin, showed: d_{25} 0.9065, d_{100} 0.8889, sapon. no. 194, I no. 147.4; temp. of turbidity 22°; contains 8.14% of lauric acid. No stearic acid is present.—Chemical Abstracts for March 20, 1914, pp. 1186-7.

63. *Meconopsis aculeata*, Royle. H.F.B.I., I. 118.

Vern.:—Guddi kum (Jhelum); Gudi (Ravi); Kanada (Sutlej) Kanta (Simla); (Pb.); Kanda (Kumaon).

Habitat:—Western Himalaya, from Kashmir to Kumaon. 11-15,000 ft.

A prickly herb, stem leafy, 1-2 ft., smooth, except the short scattered prickles, leaves irregularly pinnatifid, 4-8 in. oblong or lanceolate, long petioled, cauline, sessile. *Flowers* blue-purple, 2-3 in. diam. Pedicels slender, prickly in fruit. Capsules short and densely bristly and prickly, $\frac{1}{2}$ - $\frac{3}{4}$ in., obconic-obovate or oblong, style half as long.

Part used:—The root.

Use:—In Kashmir, the root is considered as a narcotic and in Chumba regarded as poisonous. (Stewart).

64. *M. Nipalensis*, D.C. H.F.B.I., I. 118.

Habitat:—Temperate Himalaya, Nepal, and Sikkim.

A perennial herb, with yellow juice, stellately pubescent and laxly hairy, stem 3-5 ft., stout, erect, nearly simple; young parts clothed with soft gold villous hairs. Leaves sinuate-lobed or pinnatifid. *Flowers* golden yellow, 2-3½ in. diam., in elongated, nearly simple racemes. *Sepals* densely tomentose and bristly. *Petals* 4. Ovary 1-celled, style $\frac{1}{2}$ in., persistent. Stigmatic lobes, radiating on its clubbed extremity. Capsule ovate-oblong, 8-10-valved; clothed with adpressed hairs and stellate down. Seeds small, many, rugose.

According to Hooker, "a more stately and beautiful plant can hardly be imagined, except the Hollyhock, which it somewhat resembles in miniature."

Part used:—The root.

Use:—The root is regarded as a narcotic in Kashmir.

65. *M. Wallichii*, Hook.; H.F.B.I., I. 119.

Habitat:—Temperate Himalaya, Nepal and Sikkim.

Welsh Poppy.

A prickly perennial herb; slender, stellately pubescent and softly hairy in tender parts. Stem 4-6 ft., leafy, branched. Leaves 8-12 in., pinnatifid, oblong or obovate. Lanceolate, glaucous beneath, long-petioled. *Flowers* much paniced, purple 1-1½ in. diam., many, pedicels short. *Sepals* densely pubescent, not setose. *Petals* 4. *Stamens* numerous; filaments slender; anthers erect. Style distinct, persistent, stigmatic lobes clubbed. Capsule 1 in., elliptic-oblong, 5-valved, densely bristly, seeds many, small, rugose.

Part used:—The root.

Use:—The root is used as a narcotic in Kashmir.

N. O. FUMARIACEÆ.

66. *Hypecoum procumbens*, Linn, H.F.B.I., I. 120.

Habitat:—Drier parts of the Punjab, Peshawar, Multan and the Salt Range.

A low, annual glaucous herb. Stems procumbent, many, 3-12 in., slender. Leaves 2-3-pinnatisect, 2-4 in. Segments linear or oblong, upper sessile, whorled. *Flowers* few, 1 in. diam., yellow, pedicelled. Outer petals 3-lobed. Inner petals with the lateral segments linear-oblong, obtuse, midlobe entire, retuse or 2-fid, toothed or fimbriate (H. f. and Th.). Fruit 1½-2½ in., ⅛ in. broad, curved, sub-compressed, at length breaking up into 1-seeded joints.

Parts used:—The leaves.

Uses:—The juice has the same effect as opium. The leaves act as diaphoretic. (Murray).

67. *Corydalis Govaniana*, Wall. H.F.B.I., I. 124.

Sans. :—Bhutakesi.

Vern. :—Bhutkis, bhutkesi (H. and B.)

Habitat :—Western Himalayas, 8-120,00 feet, from Kumaon to Kashmir.

Herbs with a persistent woody rootstock, which latter is often branched, crowded with red leaf-sheaths. Stem stout, 1-2 ft., as thick as the thumb, almost naked, or with 1-2 leaves near the top. Radical leaves nearly equalling the stem, many oblong, 2-pinnatisect, long-petioled, cuneate, lanceolate, cut into linear segments, 2 near the base. Cauline leaves 1-2 or 0. Racemes 2-4 in. long, terminal, dense, many-flowered. Bracts broadly cuneate, exceeding the pedicels cut about the middle. *Flowers* 1 in. long, bright yellow, posticous petal convex, back wing very broad, limb shorter than the curved slender spur. *Capsule* $\frac{1}{2}$ - $\frac{1}{3}$ in. Style persistent, half its length.

Part used :—The root.

Uses :—The root is supposed to be tonic, diuretic and alterative, and is prescribed in syphilitic, scrofulous and cutaneous affections, in the dose of from 10 to 30 grains. The drug is also often used in the form of a decoction or tincture. (Watt).

68. *C. ramosa*, Wall. H.F.B.I., I. 125.

Habitat :—Alpine Himalaya, from Sikkim to Kashmir.

A glaucous herb. Stem procumbent, weak-branched, 1-2 ft. (dwarf at high elevations), often leafy, flexuous. Radical leaves few or many, long-petioled, 2-3-times divided; alternate segments small, narrow-oblong or linear. Leaves finally decom-pound. Racemes terminal, many, lax, many-flowered. Bracts cut into linear lobes, 1-5 in., flowers $\frac{1}{2}$ in. long, yellow; posticous petal dorsally winged, hooded or shorter than the obtuse spur. Style persistent, pedicels deflexed. Capsules ovate-oblong, obtuse. Seeds shining, numerous.

Hooker mentions 3 varieties.

Use :—Dr. Aitchison, in his *Flora of the Kurram Valley*, says that in Kurram this is employed by the natives in the treatment of eye diseases, like all other plants, with yellow sap. It is there called *Mamiran*.

69. *Fumaria parviflora*, Lamk. H.F.B.I., I. 128.

Syn.:—*F. officinalis*, Bedd.

(Sanskrit) *Parpat*.

Vern.:—Pitpâpadâ, (Hind. Dec.); Ban-sulpha (Beng.); Pittapâpado (Guj.); Khasudlio (Dr. Shah); Kshetra Parputi (Hindi); Shâhatarâ, Shatra (Pers., Sind.); Tura (Tam.); Chatarashi (Tel.) Khairuwa (Kumaon.)

Habitat:—Indo-Gangetic plain, lower Himalaya and Nilghiri Mts.: a weed of cultivation. Gujrat and the Konkan.

An annual glabrous herb, pale green, much-branched. Stem diffuse, 4-24 in. Rootstock usually perennial. Leaves pinnately divided; leaflets deeply-lobed; segments very narrow, flat, lobed or entire. Flower pale pink or white, tips purple, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, in numerous, short racemes, 1-2 in.; bracts lanceolate, outer petals dissimilar, upper one broad, concave, produced at the base, in a short rounded spur, less than $\frac{1}{2}$ the length of the petal; lower one flat, narrow. Inner petals narrow, clawed, keeled (Collett). Sepals lanceolate, much smaller than the coronal-tube. Pedicels exceeding the bracts. Lower set of stamens spurred at the base, the spur projecting inside the petal-spur. Fruit, a very small globose, 1-seeded nutlet, rugose, when dry, rounded at the top, with two pits.

Pittapâpadâ is found as a weed, usually cultivated in fields in the Dekkan, the Konkan and Sindh. Described by Dalzell and by Woodrow. It has been found by Jaya Krishna Indrajī at Porebunder.

Part used:—The entire plant, except the root.

Uses:—The dried plant is regarded as efficacious in low fever, and is also used as an anthelmintic, diuretic, diaphoretic and aperient, and to purify the blood in skin diseases. (Baden-Powell).

Along with black pepper, it is used in the treatment of ague. (Royle). Mahomedan writers describe the plant as diuretic and alternative, aperient and expectorant. (Dymock.)

It has been prescribed by Dr. T. M. Shah of Junagadh usefully as a tonic in Dyspepsia and in mild fever.

Dr. Thornton is of opinion that the drug is useful in leprous affections.

The authors of the *Pharmacographia Indica* describe the drug as beneficial in dyspepsia due to torpidity of the intestines and as a valuable remedy in scrofulous skin diseases.

N. O. CRUCIFERÆ.

70. "*Matthiola incana* R. Br. H.F.B.I., I. 131.

Habitat:—Cultivated in the gardens of N. India.

Vern.:—Todri safed (Pb. Sind).

A shrubby, erect, hoary herb. Stem 1-2 ft.; branched. Leaves oblong-lanceolate, entire; rarely obscurely toothed. Raceme 1-2 in. Flowers in May-June. 1-2 in. diam., purple to violet. Siliqua glandular, 2-4 in., $\frac{1}{2}$ in. broad. Seed orbicular, winged.

Hooker says that it is the "Queen-Stock" of English gardens where it is treated as an annual or biennial.

Parts used:—The seeds.

Uses:—The seeds are said to be aphrodisiac (Stewart). The seeds are of three kinds, yellow, red and white; used in infusion in cancer, are expectorant, mixed with wine given as an antidote to poisonous bites (Dr. Emerson).

71. *Cheiranthus Chieri*, Linn. H.F.B.I., I. 132.

The English wild "Wall-flower".

Habitat:—Not indigenous, but cultivated in gardens in North India.

Vern.:—Todri Surkh, Lahoori shuboo (H); Khueri (B).

Stem shrubby, erect, bushy, branched in a determinate manner; branches angular, leafy, hoary, with close bristly silvery hairs, chiefly directed downwards, like those on both sides of the leaves; though some point the contrary way, on the leaves as well as the siliqua, being perfectly distinct from others. Leaves crowded, stalked, lanceolate, acute, almost

invariably entire; the lower-most, if any, more or less of a minute silvery hoariness especially at the back. Flowers corymbose, sweet-scented. Petals always of a uniform bright golden yellow, not stained with brown or blood-red as in the Garden Ch. Cheiri of England, though the calyx is purplish. Siliqua racemose, erect $1\frac{1}{2}$ -2 in. long, covered with close hairs chiefly, if not altogether, pointing upwards. Style prominent, crowned with a cloven stigma. Seeds flat, with a narrow membranous, deciduous border at one side as well as the summit of each.

Parts used:—The flowers and seeds.

Uses:—The *flowers*, said to be cardiac and emmenagogue, are used in paralysis and impotence. The *seed* is also used as an aphrodisiac (Irvine).

The dried petals are much used in Upper India as an aromatic stimulant (O'Shaughnessy).

The *flowers* are employed to make a medicated oil; for this purpose they are boiled in olive oil; this prepared oil is much used for enemata (Year-Book of Pharmacy, 1874, p. 622).

By extracting the flowers with low-boiling solvents, a dark-coloured pasty extract is obtained which (after evaporation of the solvent and separation from fatty and waxy matters by strong alcohol) yields, on distillation with steam, a yellowish oil of unpleasant odour having a specific gravity of 1.001, and distilling under 3 mm. pressure between 40° and 150°C. the yield is about 0.06 per cent. The alcoholic solution shows a feeble bluish fluorescence. A highly diluted alcoholic solution possesses the characteristic odour of the flowers. The oil is found to contain:—Compounds resembling mustard oil, ketones and aldehydes (having the odors of Violets and Hawthorn), nerol, geraniol, benzyl, linalool, indole, methyl antheranilate, acetic acid (probably in combination with benzyl alcohol and linalool), salicylic acid (probably as methyl salicylate) and traces of phenols and lactones. (J. Ch. I. July 15, 1911, p. 829).

Cheiranthin is obtained by evaporating the alcoholic or aqueous extract of the leaves or seeds of the wall-flower, removing the inactive oils by light petroleum, treating with lead acetate, and finally salting out the glucoside with magnesium, Sodium or ammonium sulphate, when it separates in small yellow flakes, from which the salts may be removed by means of alcohol and ether. It may also be precipitated by tannin, and in either case still contains an active alkaloid which may be removed by shaking with ether or ethylic acetate. Cheiranthin brings about the characteristic rest is frogs. J. Ch. S. LXXVI, pt. I (1899), p. 378.

The physiological action of Cheiranthin resembles that of the digitalis compounds.

Cheirinine, $C_{13}H_{25}O_{17}N_3$, obtained from the alcoholic extract of the seeds of the wall-flower, crystallises in small, colourless needles, melts at $73-74^\circ$, and is soluble in warm water, alcohol, ether, chloroform, or ethylacetate. The aqueous solution is neutral and gives precipitates with the ordinary alkaloidal reagents. The physiological action of cheirinine resembles that of quinine.

The seeds also contain choline. J. Ch. S. LXXVIII. pt. I. (1900) p. 186.

72. *Nasturtium officinale*, R. Br. H.F.B.I., I. 133.

Eng.:—The Water-cress.

Ver.:—Piriya halim (Kumaon).

Habitat:—Rohilkhand, Punjab (N. India). Found near all hill-stations, but probably introduced. Simla in ditches. Ceylon, found naturalized at Kandy (Trimen).

An aquatic. Stem creeping and floating, much branched. Leaves pinnate, the upper with 3-7 pinules and a terminal one, the lower cut into 3 repand segments. Flowers white, in short racemes. Petals longer than the sepals. Pods $\frac{1}{2}$ —1 in., stalked, spreading or bent upward; seeds small, 2-seriate.

Use:—Used as a salad, on account of its appetizing and anti-scorbutic properties.

The essential oil consists chiefly of phenylethylenethiocarbimide, $C_6H_5 \cdot CH_2 \cdot CH_2 \cdot N : CS$, which was identified by converting it into the thiocarbamide. The glucoside from which these are derived, is named '*gluconasturtiin*,' and is regarded as having the constitution—

$CH_2Ph \cdot CH_2 \cdot N \cdot C(S \cdot C_6H_{11}O_3) \cdot O \cdot SO_3K + xH_2O$, but could only be obtained as a syrup; by decomposition with silver nitrate, it gives '*silver nasturtiate*,'

$CH_2Ph \cdot CH_2 \cdot N \cdot C(SAg) \cdot O \cdot SO_3Ag + 2H_2O$, which also forms a crystalline compound with $2NH_3$, but loses this at ordinary temperatures.

When acted on by sodium thiosulphate, silver nasturtiate gives a clear solution which probably contains the sodium salt, but soon decomposes into sodium sulphate and the thiocarbamide, which can then be extracted with ether. J. Ch. S. 1899 A I. 930.

From this plant phenylethylthiocarbimide, $CH_2Ph \cdot CH \cdot NCS$ is obtained.

Silver nasturtiate is soluble in ammonia in the presence of ammonium nitrate, but is precipitated by nitric acid, and is decomposed by sodium

thiosulphate into phenylethylthiocarbamide and sodium sulphate. When an attempt was made to prepare an additive compound of the silver salt with ammonia, it was found that some of the silver was replaced at the same time by ammonium. It is noteworthy that the seeds do not contain an appreciable quantity of any enzyme capable of hydrolysing the glucoside. J. Ch. S. 1900. A1. 49.

73. *Cardamine pratensis*, Linn. H.F.B.I., I. 138.

Habitat:—Hassora in western Tibet.

A perennial glabrous herb. Stem 1 ft. Rootstock sometimes bearing small fleshy tubers. Leaves pinnate; leaflets of the radical leaves orbicular or ovate, terminal longer; those of the cauline leaves linear-oblong entire, in equi-distant pairs, angled, shortly petioled. Flowers large white or lilac, corymbose when young. Petals spreading three times as long as sepals. Pods 1 in., linear, erect. Style short.

Use:—Used as a salad for the same purpose as *Nasturtium officinale*.

74. *Farsetia Jacquemontii*, H.f. and T. H.F.B.I., I. 140.

Vern:—Mulei, farid buti, lathia, farid muli (Ph.)

Habitat:—Sandy places in the Punjab and Sindh.

An erect, rather rigid, hoary perennial herb, covered with closely adpressed hairs attached at their middle. Stems 12-18 in., branches virgate. Leaves $\frac{1}{2}$ -1 in., linear-oblong or linear. Flowers large; buds elliptic; Sepals acute, strigose; Petals half as long as the sepals. Stigma short, suberect. Pods narrow linear or linear-oblong, $1\frac{1}{2}$ -2 by $\frac{1}{2}$ - $\frac{1}{3}$ in., compressed; valves flat, nerveless or faintly one-nerved; seeds 2-seriate.

75. *F. Hamiltonii*, Royle. H.F.B.I., I. 140.

Habitat:—Upper Gangetic plain and the Punjab, from Agra westwards.

A rigid, hoary undershrub, with forked virgate branches in the Salt Range of the Punjab. Leaves linear. Flowers

spicate, distant, large; buds cylindric, sepals obtuse $\frac{1}{2}$ - $\frac{1}{4}$ in., hoary. Petals linear, obtuse, twice as long as the sepals. Pod elliptic-oblong $\frac{1}{2}$ - $\frac{3}{4}$ by $\frac{1}{2}$ - $\frac{1}{4}$ in., erect, broad; valves flat, mid-rib indistinct, or sometimes prominent; style very short. Seeds usually 2-seriate.

76. *F. Aegyptiaca* Turr. H.F.B.I., I. 140.

Vern.:—Mulei, farid buti, lathia, farid muli (Pb.).

Habitat:—Punjab, in the Salt Range.

An erect rigid perennial, covered with dense and fine, closely-adpressed pubescence; branches long, erect, virgate. Leaves linear, very narrow. Flowers small, in long spicate racemes. Buds small, subglobose; sepals, obtuse, strigose, margins scarious. Petals obovate, a little longer than the sepals, pink. Pods $\frac{1}{2}$ -1 by $\frac{1}{2}$ in., linear; valves almost nerveless; septum transparent; style slender. Seeds 1-seriate.

Medicinal Properties and Uses:—All the above three species are considered specific for rheumatism in the Punjab. They are pounded and taken as a cooling medicine (Stewart).

77. *Sisymbrium Sophia*, Linn. H.F.B.I., I. 150.

Habitat:—Punjab, in the Salt Range and near Peshawar; Temperate Himalaya, from Kumaon to Kashmir, Simla, Western Tibet.

An annual, erect, glabrous or finely pubescent herb. Stems 1-2 ft. Leaves numerous $1\frac{1}{2}$ -2 in., sessile, twice or thrice pinnatisect; segments short, thread-like. Flowers pale yellow; pedicels slender, ebracteate. Pods glabrous, slender, 1 in., slightly flattened, curved, erect, or spreading, cylindric; mid-rib prominent; stigma subsessile.

Use:—The Seeds are used medicinally as a substitute or adulterant for those of *S. Irio*. (Stewart).

78. *S. Irio*, Linn. H.F.B.I., I. 150.

Vern.:—(Seeds) Khub kalan (Hind.); Naktrasa, Jangli sarson, Khub Kalan, Khaksi, (Pb.) Parjan; (Merwara); Jangli-

Surson, (Sindh) ; Khakshi (Bomb.) ; Rantikhi (Mar.) ; Khakshir (Pers.)

Habitat :—Northern India, from Rajputana to the Punjab.

An annual or biennial, tall, glabrous herb. Stem 1-3 ft., quite glabrous or slightly pubescent at base. Leaves petioled, runcinate, pinnatifid, segments remote, spreading, toothed not auricled ; terminal large, sometimes hastate. Pedicels slender. Flowers yellow, minute. Fruiting pedicels slender, young pods overtopping the raceme. Old 3-nerved. Pods $1\frac{1}{2}$ -2 in., slender, erect, glabrous, subtorulose.

Parts used :—The seeds.

Use :—The seed is expectorant and restorative, and used externally as a stimulating poultice (Dymock.)

It is also said to be a febrifuge (Stewart.)

79. *Brassica nigra*, Koch. H.F.B.I., I. 156.

Syn. :—*Sinapis erysimoides*, Roxb. 499.

Sans. :—Sarshap.

Vern. :—Râi, Kâli râi, tira, taramira, lahi, banarsirai, jag-râi, asl-râi, ghor-râi, makra-râi (H) ; Râi-Saron, (Bom.) ; Kadagho (Tam) ; Avalo (Tel.) ; Bile Sasive, Karisasive, sasive, (Kan.) ; Ahor, Suraj, Kali-surson (Sindh) ; Kali Sarson (Kumaon).

Habitat :—Cultivated in various parts of India.

An annual, 2-3 ft. high, rigid, branched, more or less hispid. Leaves 4-8 in., petioled ; lower lyrate, upper entire. Racemes naked. Flowers $\frac{1}{2}$ - $\frac{1}{2}$ in. diam., bright yellow. Sepals spreading. Pods $\frac{1}{2}$ - $\frac{1}{2}$ in., subulate ; valves keeled, torulose ; cells 3-5-seeded. Seeds oblong.

Parts used :—The seeds.

Uses :—The seeds of this plant are used in medicine as poultice, being a useful and simple rubefacient and vesicant. Mustard poultices prove highly serviceable in cases of febrile and inflammatory diseases, internal congestions, spasmodic, neuralgic, and rheumatic affections. Mustard flour in water is highly recommended as a speedy and safe emetic.

The seeds act as a digestive condiment, if taken moderately.

If swallowed whole they operate as a laxative, and for this purpose are sometimes prescribed in dyspepsia and other complaints attended with torpid bowels (Watt).

The pure fresh oil is a stimulant and mild counter-irritant when applied externally. As such, it is very useful in mild attacks of sore-throat, internal congestion, and chronic muscular rheumatism (Surg. D. Basu, Faridpur).

The oil rubbed on the feet and the bridge of the nose cut short a head cold in one night. I have never seen it fail. In slight bronchitic affections of children, it makes a very useful mild counter-irritant application to the chest. It is also a very useful application in ordinary sore-throat (Surg. K. D. Ghose).

80. *B. campestris*, Linn. H.F.B.I., I. 156.

Syn. :—*Sinapis dichotoma* and *S. Glauca*. *Roxb.* 497, 498.

Vern. :—Sarson, Sarson-zard, bara-lai, Sheta-Shirsa, banga-sarson, pila-sarson, rara-sarson, pili rai (H.); shwet-rai (B.); Sarashire, raira (Guj.); Hile-rayan (Deck.).

Habitat :—Cultivated throughout India.

(Variety Sarson, Prain F. B. Ind. I 156——under *B. campestris*, sub-species *Napus*). Stem 4-5 ft., unbranched or branching only near the top. Leaves glaucous, all (except the lowest 2 or 3), with stem clasping basal lobes; lower leaves pinnati-partite, 6-8 by 2-3 in., terminal lobe much the largest; upper leaves oblong or lanceolate, 2½-3 in., more or less pinnatifid. Flowers nearly ½ in. diam. Pods various, erect or pendent, sometimes 3 or 4-valved; erect pods 2 in., pendent pods 3-3½ in. long, including the beak; beak conical, up to 1 in. Seeds 30-80 in a pod. A cold weather crop in the plains and hills, up to 6,000 ft. Indian Colza. Native name *Sarson*.

Parts used :—The seeds.

Uses :—The oil, combined with camphor, forms an efficacious embrocation in muscular rheumatism, stiff neck, &c. The seeds mixed with hot water form an efficient counter-irritant

poultice. The oil used in dengue fever with great benefit. Used for rubbing on the chest in bronchitis. Action similar to mustard, but less effective.

81. *B. Juncea*, *H. f. and T.* H.F.B.I., I. 157.

Syn.:—*Sinapis ramosa*, *Roxb*; *S. cuneifolia*, *Roxb*, *S. rugosa*, *Roxb*. 498 and 499.

Sans.:—Rājika (Kumaon.)

Vern.:—Rāi, Sarson, Sarson-lahi, gohna-sarson, bari-rāi, barlai, badshai-rāi, Khas-rāi (H); Rāi sarisha, (B); Asur (Kashmir); Rāi (Guz.); Mohari; rāyi (Mar.).

Habitat:—Cultivated in India.

A tall, erect, branching annual, rarely glaucous, or hispid at the base only. Stem 3-6 ft., much-branched. Lower leaves petioled, sometimes pinnatifid, upper large, lanceolate, toothed, subsessile. Terminal lobe much the largest. Blade of the basal leaves 6-8 by 2-4 in., toothed; upper leaves 2-2½ in., entire. Flowers bright yellow; sepals spreading ½ in.: diam. Pods 2¼-2½ in. including the beak, linear-lanceolate; beak narrowly-conical, ½ in.; valves with a prominent mid-rib. Seeds small, dark rugose, globose, about 40 in a pod.

Parts used:—The seeds.

Uses:—"The seeds commonly met with in the bazaars of India, which, from their colour, may be denominated *Brown Mustard Seed*, possess properties similar to those of the black and white mustard seed, for which they may be employed as an efficient substitute, especially in the preparation of mustard poultices." (*Pharm. of Ind.*)

"Externally used in internal congestions, in spasmodic, neuralgic, and rheumatic affections, and in morbid states of the cerebro-spinal system, as an emetic. Taken internally, it acts as a digestive." (Bombay Pharmacopœia Committee).

82. *Eruca sativa*, *Lam.* H.F.B.I., I. 158.

Eng.:—The rocket.

Vern.:—Safed-sarsu (Bombay).

An annual or biennial herb, glabrous or slightly hairy, glaucous. Stem 6-18 in., erect, branching. Leaves sessile, 1-4 in., pinnatifid; segments coarsely toothed, terminal, one broad; upper leaves smaller, sometimes very entire. Flowers pale yellow or white, $\frac{3}{4}$ in. across in racemes; veins dark. Sepals erect, lateral, slightly saccate. Petals clawed. Stigma capitate. Pods erect, pressed against stem, oblong-ovoid, $\frac{1}{2}$ -1 in., nearly terete, prolonged in a flat-pointed, seedless beak half the length of the valves. Seeds in two rows. Cotyledons folded longitudinally over the radicle (Collett.)

Cultivated as a field-crop in N. W. Provinces, for the oil expressed from the seed. Simla. An escape; cultivated in Central India, Western Himalaya, Upper Gangetic valley.

Use:—It has properties similar to those of the water-cress and the cuckoo flower. It is acrid and used for purposes similar to those of Mustard.

The seeds are dark brown or dark grey and yield 30·8 per cent. of clear yellow oil with a slight mustardlike odor and taste. Sp. gr. at 15° C., 0·915 Saponification value, 175·7; iodine value, 101·6. The oil could probably be used as a substitute for rape or colza oil. 100 seeds weigh only 0·25 gm.

Bulletin Imperial Institute 1913.

83. *Capsella Bursa-Pastoris*, Moench, H.F.B.I., I. 159.

Habitat:—A cosmopolitan weed in the vicinity of cultivation throughout temperate India.

An annual herb, more or less covered with forked hairs; root long, tapering. Stems erect, 6-18 in., branched. Radical leaves variable, usually pinnatifid, sometimes lanceolate, terminal lobe broadly triangular; segments nearly entire; upper leaves pinnatifid, lobed at the base, stem-clasping; uppermost lanceolate. Flowers small, $\frac{1}{10}$ in. diam.; white, racemed. Sepals spreading, equal at the base. Pods nearly flat, triangular or obcordate, about $\frac{1}{4}$ in. broad. Seeds many, in two rows, oblong, punctate; radicle incumbent.

Use:—"This very common weed is bitter and pungent, yields a volatile oil on distillation identical with the oil of mustard, and has been used as an antiscorbutic, also in hæmaturia

and other hæmorrhages, as well as in dropsy." (U. S. Dispensatory.)

84. *Lepidium sativum*, Linn. H.F.B.I., I. 159.

Sans. :—Chandrasura.

Vern. :—Halim (Kumaon) chausaur (H.) ; Assalia, Ahliya, (Bomb.) ; Ali verai (Tam.) ; Adit-yalu (Tel.) ; Halim, aleverie (B.) ; tezak (Pb.) ; Ahero (Sind.) ; Asalio halim (Guz.) ; Allibija. (Kan.)

Habitat :—Cultivated throughout India.

An annual, erect, glabrous herb. Stems erect, 6-18 in., branched. Radical leaves twice-pinnatisect, long-petioled. Cauline sessile and usually entire, say Hooker. f. and T. Anderson ; pinnatifid or lanceolate, says Sir Henry Collett. Flowers small, white, in long racemes. Sepals erect, equal at the base. Pods ovate, $\frac{1}{2}$ in., notched at the tip ; margins winged, wings narrow. Pods orbicular-ovate (H. f. and T). Pedicels adpressed. Seeds one in each cell. Radicle incumbent, cotyledons divided.

In Simla fields ; flowers in April and May.

It is the garden cress of Europe and Asia.

Parts used :—The seed and leaves.

Use :—According to the Sanskrit writers, the seeds are described as tonic and alterative, efficacious in hiccup, diarrhœa and skin diseases (U. C. Dutt).

The Mahomedan writers consider the seeds to have aphrodisiac and diuretic properties ; they recommend them for the dispersion of certain chronic enlargements of the spleen, &c., and as an alterative in various diseased conditions supposed to be produced by cold humors (Dymock).

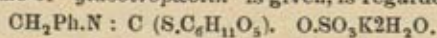
According to Honigberger, the plant in the Punjab was administered in cases of asthma, cough with expectoration and bleeding piles. The root is used in secondary syphilis and tenesmus.

According to Bellew, the seeds are also considered to be galactagogue in the Punjab, and are administered after being boiled with milk, to cause abortion. O'Shaughnessy found the drug answer as a gentle and warm aperient.

Moodeen Sheriff writes of the seeds thus:—"Externally, it is of great service in all the diseases in which the mustard is resorted to. The thick and very gummy mucilage of the seeds acts as a mechanical antidote in cases of poisoning by irritant substances, enveloping the poisonous particles and sheathing the mucous membrane of the stomach and intestine." He regards the seed as a more satisfactory rubefacient than that of mustard prepared in India. According to him, the mucilage obtainable from the seeds may be used as a substitute for imported tragacanth and gum Arabic. "The best medicinal property of this drug, is its usefulness in dysentery and dysenteric diarrhœa. The coarse powder and the thick and very gummy mucilage of the seeds appear well-suited to allay the irritation of the mucous coat of the intestines in those diseases, and they thus relieve or check their symptoms to a considerable extent.

The leaves are gently stimulant and diuretic, as a salad, serviceable in scorbutic diseases (Balfour). The oil extracted from the seeds is also used medicinally.

When prepared by steam distillation from the finely cut plants, the essential oils of *L. sativum* consist principally of benzylthiocarbimide; this is always mixed with benzylic cyanide, especially if the plants are only coarsely cut before the distillation. Both compounds are produced by the decomposition of a glucoside, the former by the action of the ferment myrosin, and the latter by the action of boiling water and acids. The glucoside could not be obtained in crystals, but when decomposed by silver nitrate gave an insoluble silver derivative, which dissolved at once in ammonia, separating again in a crystalline form with two molecules of ammonia; to this compound the formula $\text{CH}_2\text{Ph} \cdot \text{N} : \text{C} (\text{SAg}) \cdot \text{O} \cdot \text{SO}_3 \text{Ag} + 2\text{NH}_3$ is assigned, and the acid from which it is derived is named 'tropaeolic acid'; the glucoside, to which the name of 'glucotropæolin' is given, is regarded as having the constitution—



When acted on by sodium thiosulphate, silver tropeolate gives a clear solution which probably contains the sodium salt, but soon decomposes into sodium sulphate and the thiocarbimide, which can then be extracted with ether. J. Ch. S. 1899A I. 930.

85. *Raphanus sativus*, Linn. H.F.B.I., I. 166.

Vern. :—Muli (H.); Mula (B.); Mulli (Dec.); Mullangi, (Tam., Tel. and Kan.); Moore (Sind.). Tara mira, muri mungra, (Pb.).

A coarse rough annual, edible, cultivated throughout India in gardens. Root fleshy, pungent, variable in size and form. Leaves roughly pilose; lower ones lyrate. Flowers variable, usually white or lilac, with purple veins. Pods indehiscent, terete, 1 in. to 2ft. (*R. caudatus*), more or less constricted between the seeds, prolonged beyond the valves in a pointed beak, about half the length of the pod. Seeds separated by pith.

Parts used :—The seeds, and root.

Uses :—The seeds are diuretic, laxative, and lithontriptic, and the roots used for urinary and syphilitic diseases. Stewart says the seeds are considered to be emmenagogue in the Punjab.

The seeds, in doses of one drachm, are useful in gonorrhœa. The root is a reputed medicine for piles and gastrodynic pain (Watt).

The juice of the fresh leaves is also used as a diuretic and laxative.

In full and repeated doses, the seeds sometimes produce vomiting, but this is so rare that they cannot be regarded as an emetic (Moodeen Sheriff).

N. O. CAPPARIDEÆ.

86. *Cleome viscosa*, Linn. H.F.B.I., I. 170. Roxb. 501.

Syn. :—*Polanisia icosandra*, W. & A.

Sans. :—Barbara, Karnasphota, Tilparni, Âdityabhakta.

Vern. :—Kânphuti, Hulhul, Purhur (H.); Boogra (Pb.); Hoor-hooria (B.); Kathoree (Sind.), Kânphuti, Pivala tilavana, (Bomb.); Nayavayhe, Nahikuddagho (Tamil); Kukawominta, (Teling.); Kat-kuddagho (Mal.); Jangli-hulvul, Choorai-ajwani, (Dec.); Tinmani, Tilwan (Guz.). Wal-aba, Ran-manissa (Sinhalese).

Habitat :—Throughout tropical and warm India; Bombay, Thana, Gujerat, Ceylon.

An annual herb, 1-3ft., erect, sparingly branched, softly sessile, ovate, entire, terminal the largest, lateral often unequal at base; petioles $\frac{1}{2}$ -1 in., becoming shorter above and uppermost (bracts) often sessile; flowers lemon-yellow, $\frac{3}{4}$ in. diam., on axillary pedicels $\frac{1}{2}$ in. long; sepals ovate, acute; petals twice the length of sepals, obtuse long-clawed, 2 approximate, 2 divaricate; Stamens 12-24, anthers curled, blue-black; pod 2-4 in. without a gynophore, erect, linear, cylindrical tipped by glabrous blunt style, very viscous; seeds black, finely ridged on back.

A common weed in cultivated ground. Throughout the tropical regions of the world.

Parts used:—The seeds, leaves and roots.

Uses:—The seeds used as anthelmintic and carminative by the Vytians (Ainslie); the juice of the leaves poured into the ear to relieve ear-ache, and the bruised leaves are applied to the skin as a counter-irritant.

In Cochin China, the whole plant, bruised, is used for counter-irritation and blistering. (O'Shaughnessy).

According to Moodeen Sheriff, the seeds are anthelmintic, rubefacient and vesicant. The seeds are valuable in expelling round worms, and also as a rubefacient and vesicant in all the complaints in which mustard is used. The leaves are also useful in the same way as a local stimulant, and the juice possesses a curative influence over some cases of otalgia and otorrhœa. The seeds are used internally in powder with sugar, and externally in the form of a poultice or paste by bruising with vinegar, lime-juice or hot-water, and their juice for the use of the ear is pressed out by bruising them without water. As a rubefacient and vesicant, the seeds under examination are much superior to the mustard seeds in this country, and quite equal to the mustard imported from Europe."

Used by the aborigines of Australia to relieve headache. In the United States, the roots are said to be used as a vermifuge. Ph. J. Sep. 1. 1888, p. 179.

The seeds are given occasionally in fevers and diarrhœa (Lindley).

At the 2nd Australasian Medical Congress, held at Melbourne, in January 1889, Surgeon-Major K. R. Kirtikar exhibited a specimen of oil obtained from the seeds of *Cleome viscosa*, Linn. (prepared by the late Mr. Periera of the Bombay Medical Stores), and made the following observations on the occasion. "The plant has a great reputation as a remedy for chronic Otorrhœa. The action is chiefly antiseptic, as it contains a powerful volatile principle, not unlike in smell to that of mustard. This active principle has, besides, stimulating properties."

87. *Gynandropsis pentaphylla*, DC. H.F.B.I.,
I. 171.

Syn. :—*Cleome pentaphylla*, Linn. ; Roxb. 500, 501.

Sans. :—Surjāvarta ; Arkapushpikā.

Vern. :—Hûrhûr, hulhul, karaila, churota (H.) ; Harhuriya Kánálá, bansarishá, arkahuli, Sádáhurhidiá (B.) ; Setakata arak, Guma (Santal.) ; kathal parhar (U. P.) ; Halhal (Dec.) ; kinro, (Sind.) ; Tilavana, mâbli (Mar.) ; velai, neivaylla, kadughu (Tam.) ; Várinta, vela-kura, (Tel.) ; tai-vélá, kara-velá, vélá (Malay.)

Habitat :—A common weed throughout the warm parts of India. Very common in Ceylon in waste and cultivated ground.

An erect, branched annual 2-4 ft. Stem shaggy with long, white, spreading hair. Leaves 5-foliolate, leaflets sessile, broadly ovate, acute, entire, pubescent on both sides and ciliate, pale beneath, terminal largest, $1\frac{1}{2}$ -2 in. ; petiole 2 in., stout, hairy and rough with prickles ; flowers at first distinctly corymbose, afterwards in long erect racemes, bracts of 3 sessile leaflets, many empty. Pedicels over $\frac{1}{2}$ in., viscid, pubescent ; sepals narrowly lanceolate, acute glandular-pubescent ; petals rotundate, with a long narrow claw thrice the length of sepals, all curved upward ; stamens inserted about half-way up ; ovary on summit of a gynophore, linear-oblong, very glandular ; style 0, stigma capitate, flat ; ovules numerous ; pods 2-3 in., linear, slightly curved, somewhat compressed, viscid, pubescent. Seeds helicoid-reniform, rough, dark brown (Trimen).

Petals white or very pale pink, with pink claws, gynophore and stamens purplish.

The internodes of the floral axis (gynophore) between the whorl of petals, stamens and ovary are remarkably developed in this plant (Trimen).

Parts used :—The seeds, leaves and root.

Uses :—Sir W. JONES observes that its sensible qualities seem to promise great antispasmodic virtues, it having a smell much resembling assafoetida, but comparatively delicate. According to Dr. Wight (*Illustr. i.*, p. 34), the bruised leaves are rubefacient and vesicant, producing a very copious exudation, affording in many cases the relief obtained from a blister without its inconveniences. The expressed juice is a popular remedy, in high repute as a local application in otalgia, both amongst the natives of India and the settlers in the West Indies, where the plant is also indigenous. Dr. J. Shortt states that the seeds are used as a substitute for mustard, and yield a good (fixed?) oil. (Ph. Ind.).

The seeds are anthelmintic and rubefacient, and are employed internally for the expulsion of round worms, and, externally as a counter-irritant. The juice of the leaves is used in otalgia. The leaves are applied externally to boils to prevent the formation of pus. A decoction of the root is said to be a mild febrifuge.

The seeds yield to ether about 25 per cent. of a thick greenish, drying oil, having an acid value of 6.4; saponification value, 194.6, and iodine value, 119.5. [D. Hooper, Ann. Rept. Indian Museum, Industrial section 1908-9].

88. *Mærua arenaria*, H. f. and T. H.F.B.I.

i. 171.

Vern. :—Pumichakarei (Tam.); Puta-tiga (Tel.); Vika (Guzerati).

Habitat :—Western Himalaya. Drier parts of the N. W. Provinces. Southern and Central India; Ceylon.

A large woody climber, or straggling shrub, with divaricate branches; bark smooth, pale. Leaves 1-2 in. oval or

oblong-oval, very obtuse or retuse, entire, glabrous, glaucous, somewhat fleshy; petiole $\frac{1}{4}$ in. Flowers few, rather large, in terminal corymbose racemes, without bracts; pedicels $\frac{3}{4}$ in., smooth; Calyx-lobes $\frac{1}{4}$ in., lanceolate, acute or obtuse, reflexed. Petals distant, $\frac{1}{4}$ in., ovate, acute, erect, veined, green. Stamens much exceeding petals, spreading; filaments white, anthers green; gynophore $\frac{1}{4}$ in., ovary short, truncate. Fruit yellow, 1-3 in. (Brandis); a berry 1-2 in. long, fleshy, irregularly, and interrupted by moniliform, smooth, many-seeded; each seed portion forming almost a separate berry. Cotyledons fleshy, involute. Flowers green, sweet-scented.

Part used:—The root.

Use:—The root slightly resembles liquorice root in appearance and taste. It is said to be used as an alterative, tonic and stimulant.

This plant has two varieties:—Var. 1. *glabra*. Hooker's Ic. Pl. t. 127.

Var. 2. *scabra*. Camb in Jacq. Voy. Bot. 22, t-23, 24. Niebuhria oblongifolia, Royle Ill. 73.

89. *Crataeva religiosa*, Forsk. H.F.B.I., I. 172.

Syn.:—Capparis trifoliata, Roxb. 426.

Sans.:—Varuna; asmarighna.

Vern.:—Barua, barun, bilasi, bila, biliana (Hind.); Barun, tikto-shak (Beng.); Tailadu, bun boronda (Mehi); Purbong, (Lepcha); Barua, barnahi, (Pb.); Raj Bela, bel (C.P.); Vâyavarna, Chatavarna, hadavarna, kunla, warnna, karvan (Bomb.); kumla, karwan (Mar.); maralingam, marvilinga, narvala, (Tam.); (Nirvala vituse) (Kan., Mal.); uskia, usiki, asiki maun, ulimidi, urimidi, urimitti, tella ulimidi, tella vule (Tel.).

Habitat:—Near streams in Malabar and Canara; cultivated elsewhere in India.

A moderate-sized, spreading, unarmed, deciduous, tree. Bark grey, $\frac{1}{2}$ in. thick, with long horizontal wrinkles. Wood yellowish-white, when old turning light brown, moderately

hard, even-grained. Pores moderate-sized, numerous and uniformly distributed, often sub-divided, each pore surrounded by a whitish ring. Medullary rays very wavy, fine and moderately broad, the distance between the rays slightly greater than the transverse diameter of the pores (Gamble). Branches with large white lenticels. Leaves clustered at the ends of branchlets, common petiole 2-4 in. long; leaflets 3-6 by $1\frac{1}{4}$ - $2\frac{1}{2}$ in., abruptly or gradually acuminate, pale beneath, ovate-lanceolate or ovate, the lateral form an oblique basis; petiolules articulate. Flowers 2 in. diam.; "cream coloured" (Brandis); "large greenish yellow at length purplish" (Hooker, f. and Thoms.); appearing with the leaves, in terminal corymbs. Petals ovate or oblong, obtuse or acute; claw $\frac{1}{4}$ as long as the limb. Berry ovoid or globose, 2-3 in. diam; rind hard, rough, with numerous white specks; very variable. Seeds $\frac{1}{4}$ in. long; numerous, reinform, in a yellow pulp.

Parts used:—The bark, leaves, and root-bark.

Uses:—The bark is demulcent, antipyretic, sedative, alterative, and tonic; and the fresh leaves and root-bark are rubefacient.

The bark is useful in some cases of urinary complaints and fever, and in some mild forms of skin diseases in which sarsaparilla is generally resorted to. It also relieves vomiting and other symptoms of gastric irritation. The fresh leaves and root-bark, particularly the former, are very efficacious in all the affections in which mustard poultice is indicated.

"Bruised well with a little vinegar, lime-juice or hot water and applied to the skin in the form of a poultice or paste, the fresh leaves of *C. religiosa* act as a rubefacient and vesicant so efficiently that I do not hesitate in saying that they are not only much superior to the mustard seeds in this country, but also quite equal, if not superior, to the flour of that drug imported from Europe. From 5 to 10 or 15 minutes is the time required for them to produce their full effect as a rubefacient, and if kept longer than this in contact with the skin, they begin to act as a vesicant. The existence of one or two plants of *C. religiosa* in each Hospital and Dispensary will

certainly save them from the cost of the supply of Europe mustard for external use. The plant grows well with ordinary care."

"The fresh root-bark of this plant is also a very good rubefacient and vesicant, but it is rather too dear and not procurable in large quantities. The bark of the stem is very thick (from 1 to 2 inches when fresh, and from $\frac{1}{2}$ to 1 inch when dry), greenish brown on the outer side, and grey or pale-white internally and on the inner side, and almost tasteless and odourless. It is one of those barks which can be easily reduced to a coarse powder, immediately after its removal from the stem." (Moodeen Sheriff).

The bark of the stem and root of this plant constitute the principal medicine of the Hindoo Pharmacopœia for calculus affections. It is said to promote the appetite, decrease the secretion of the bile, act as laxative and remove disorders of the urinary organs. (U. C. Dutt).

In Bombay, the leaves are used as a remedy for swelling of the feet, and a burning sensation in the soles of the feet * * The leaf-juice is given in rheumatism in the Concan, in doses of $\frac{1}{2}$ to 3 tolas, mixed with cocoanut juice and *Ghi*. In caries of the bones of the nose, the leaf is smoked and the smoke exhaled through the nose. The bark and the leaf pounded and tied in a cloth are used as a fomentation in rheumatism (Dymock).

90. *Cadaba indica*, Lamk. H.F.B.I. I., 172.

Syn. :—*Stroemeria tetrandra* Vahl. Roxb. 267.

Vern. :—Kodhab (Sindh, and Hindi); Habab (Bomb.) Che-moodda (Tel.).

Habitat :—Western Peninsula, Sind, Concan, Deccan and Coromandal Coast, on old walls and in waste dry places.

A shrub often straggling or half-climbing, much-branched, glabrous or pubescent. "Bark brown, sometimes rough,

with horizontal lenticels. Wood white, moderately hard, close-grained. Pores small, numerous, in long radial strings between the fine, wavy medullary-rays, usually one or two rays without pores between the string. Faint, rather distant, concentric lines which may be annual rings" (Gamble). Leaves simple, 1-1½ in., ovate or oblong, acute, obtuse or mucronate. Flowers yellowish white or greenish white, 1 in. diam.; corymbs few-flowered, terminal; bracts small, subulate. Sepals ovate; claw of petals narrow. Petals 4, limb oblong, ovate; Stamens 4. Disk process ¾ in. curved pink, smooth, fimbriate. Fruit cylindric, dehiscent, 1-1½ in. long, irregularly torulose; pulp orange. Flowers October-March.

Uses:—The leaves and root are considered deobstruent and anthelmintic, and are prescribed in decoction in uterine obstructions (Murray. 55.)

91. *C. farinosa*. Forsk. H.F.B.I., I. 173.

Habitat:—Dry places in the Punjab, at Multan and in Sindh.

A straggling, much-branched shrub. Wood white, soft, even-grained; Pores small, single or few or many in radial strings between the rays, there being usually a few rays without pores between each pair that contains them. Medullary rays very fine, regular, numerous. Leaves ¼-½ in. rarely 1 in., hoary, ovate or oblong, obtuse. Flowers as in *C. indica*, but petals very narrow, 4, spatulate. Stamens 5. Fruit ½-1½ in. cylindric (Hooker, f. and Thoms.:—"Delessert's Icones represent 6 stamens, we find 5 only. Fl. B. I. Vol. I, p. 173.

Uses:—It is used medicinally in Sindh.

92. *Capparis spinosa*, Linn. H.F.B.I., I. 173.

Syn.:—*C. Murrayana*, Graham.

Vern.:—Kabra, ber (H.); ulra Kanta (Kumaon); Kaur, Kiari, bauri, ber, bandar, bassar, Kakri, Kander, taker, borar, Keri, Kaba, barari (Pb.); Kalvari (Sind.); Kabar (Bom).

Habitat :—Hot Western Himalayan Valleys eastward to Nepal, Sindh, the Punjab, and Western Peninsula in the Mahabaleswar hills.

A diffuse, prostrate or trailing shrub. Buds long; green branches and young shoots pubescent or covered with soft caducous white, green or yellowish tomentum. Stipulary thorns yellow, hooked or nearly straight. Leaves orbicular or broadly ovate, entire, mucronate, 1-2 in. diam; petioles $\frac{3}{10}$ in. long. Flowers 1-3 in. across, white, large showy, axillary solitary; pedicels 1-2 in. long, thickened in fruit; filaments long, slender, purple. Ovary on a slender, filiform gynophore. Fruit 1-3 in. long, many-seeded, oblong, ribbed on a stout gynophore, bent downwards when ripe, irregularly dehiscent, crimson inside; seeds numerous, uniform.

Parts used :—The root and root-bark.

Uses :—The author of the *Makhzan-ul-Advia* considers the root-bark to be hot and dry and to act as a detergent and astringent, expelling cold humours; it is therefore recommended in palsy, dropsy, and gouty and rheumatic affections; the juice of the fresh plant is directed to be dropped into the ear to kill worms, just as *Cleome* juice is used in India; all parts of the plants are said to have a stimulating and astringent effect when applied locally (Dymock). In Kangra, the macerated roots are applied to sores (Stewart). Ainslie notices its use as an external application to malignant ulcers.

"The dried bark of the root is considered diuretic, and was formerly employed in obstructions of the liver and spleen, amenorrhœa, and chronic rheumatism." (United States Dispensatory).

The flower buds contain caper-quercitrin, having the formula $C_{27} H_{30} O_{16}$. On hydrolysis, this yields caper-quercetin $C_{13} H_{12} O_7$, in addition to glucose and isodulcitol. The amount of sugar formed on hydrolysis is as follows :—

Caper-quercitrin	...	...	Sugar as isodulcite,	Quercetin,
			per cent.	per cent.
			56.73	49.61

J. Ch. S. LXVI, pt. I. (1894), p. 299.

93. *C. Zeylanica*, Linn. H.F.B.I., I. 174.

Syn.:—*C. acuminata*, Roxb. 424, Clarke's Ed.

Vern.:—Wāgeti or Govindphal (Concan). Kalokera (B.) Authoondy kai (Tam.).

Habitat:—Common in the Carnatic and Malabar; occasional in the Western Deccan.

A rigid wiry, much-branched shrub, glabrous, armed; shoots sometimes puberulous. Leaves broad, ovate to lanceolate, usually acute and mucronate, reticulate beneath; $\frac{1}{2}$ -1 $\frac{1}{2}$ in. coriaceous, shining above, sometimes pubescent beneath (H.f. and Th.). Brandis says:—"Leaves ovate-lanceolate, pale beneath, $1\frac{1}{4}$ -4 in.; secondary and reticulate tertiary nerves prominent." Flowers 2 in. diam., solitary, axillary or 2-3 on a short shoot; sepals 4, free, mostly imbricate in bud. Petals 4; 2 lower petals yellowish, changing to red-brown; pedicels 1-2 in., slender. Brandis says the petals are white, with a basal blotch of yellow which turns purple. Trimen says the flowers are white; the 2 upper petals, usually with a basal blotch of yellow, afterwards purple; anthers pale blue. Stamens numerous, inserted on a small disc. Filaments longer than the petals. Ovary oblong, pubescent, on a slender gynophore. Fruit 2 in., ovoid, smooth; bright scarlet when ripe, fleshy; orange-pink when ripe, says Trimen. Seeds many, embedded in pulp, colytedons convolute.

Uses:—The root is reported to be a cooling medicine in the Concan (Dymock). The green fruit is sliced, dried, cooked and eaten in Ceylon, says Trimen. The people of Bombay do the same.

94. *C. Heyneana*, Wall, H.F.B.I., I. 174.

Vern.:—Chayrukha (H.).

Habitat:—From South Concan and Canara to Travancore.

An erect, much-branched evergreen shrub, with minute straight stipulary thorns. Young parts red, floccose. Leaves ovate, lanceolate, acute coriaceous dark green, shining above, reddish, strongly ribbed and veined beneath. Blade 3-6 in. by

$\frac{1}{4}$ – $\frac{3}{10}$ in.; petiole about $\frac{2}{3}$ in. long, stout. Flowers large, 3 in. across, solitary or in terminal bracteate, short racemes; bracts linear, red-tomentose, pedicels $1\frac{1}{2}$ in. long. Petals pale blue or white, the lower two each with a yellow spot at the base. Filaments as long as the petals. Gynophore $1-1\frac{1}{2}$ in. long; ovary tomentose. Fruit ovoid, beaked, size of a large olive.

Uses:—The leaves are used for rheumatic pains in the joints, and its flowers as a laxative drink. (Voigt. 74.)

95. *C. aphylla*, Roth, H.F.B.I., I. 174.

Sans.:—*Karira*.

Vern.:—Karil, Karer Kurrel, lete, Karu (H.); Kari (Behar, Bom.); Kirra Kerin, Karil, Karia, Karis, teuti, delha pinju (Pb.), Kiral, Kurrur, dora Kiram, Kiram, Kirad (Sind.); Ker (Guz.); Kera, Karil (Mar.); Karyal (Deck).

Habitat:—In the arid desert tracts of the Punjab, Rajputana, Guzerat, the Deccan and S. Carnatic.

Shrubs dense, much-branched, glabrous, with thorns in pairs, straight; leaves (only on young shoots) glabrous, linear, pungent, buds pubescent. Branches slender, glabrous. Flowers 1 in. diam., red-brown, in many-flowered corymbs, on short shoots. Outer sepals subvalvate, ciliate, inner saccate. Stamens 18-20. Fruit $\frac{1}{2}$ – $\frac{2}{3}$ in., glabrous, long beaked.

Parts used:—The shoots, fruit and bark.

Uses:—The bark is described by the Hindoo writers as bitter and laxative, and is said to be useful in inflammatory swellings (U. C. Dutt.) The fruit is eaten pickled in Bombay by Hindus, Bhatias especially.

In the Punjab, the top shoots and young leaves are made into a powder and used as a blister (Stewart); it is also used in boils, eruptions and swellings, and as an antidote to poison; also in affections of the joints (B. Powell).

According to Surg-Major Calthrop, the fruit when eaten causes obstinate constipation. It is used largely in the Harriana and Karnal Districts as an astringent.

The top shoots and young leaves are very efficacious in relieving toothache when chewed. (Murray, *Plants and Drugs*

of Sindh, p. 154) The fruit is pickled by Banyas of Bombay, i.e., natives of Surat.

Dr. Dymock says that the plant possesses somewhat similar properties to *C. spinosa*.

96. *C. sepiaria*, Linn., H.F.B.I., I. 177. Roxb. 425.

Sanskrit—Kākādani, Gridhranakhi.

Vern. :—Hiun, garua hins (Pb.); Kanta-gur-Kāmai, Kalia Kara (B.); Kanti Kapali (Uriya); Kanthar (Guz.); Nella-uppi (Tell.); Kanthârrel (Marathi).

Habitat :—Dry places throughout India, from the Punjab and Sindh to Burma and Carnatic.

A straggling large, wiry-branched shrub or small tree. Branchlets pubescent, hoary or tomentose. Dark-brown, $\frac{1}{8}$ in. thick, often studded with thorns in pairs. Wood white, hard, sometimes with occasional rings of dark liber-like tissue. Pores moderate-sized, scanty, in white rings. Medullary rings short, fine to moderately broad. Faint white concentric bands across the rays (Gamble). Thorns recurved, being modified stipules. Leaves ovate-oblong, obovate or oblong-lanceolate, subacute or retuse, elliptic or elliptic-lanceolate, penni-nerved, downy (rarely glabrous) beneath; $\frac{3}{4}$ - $1\frac{1}{4}$ by $\frac{1}{2}$ - $\frac{3}{4}$ in.; petiole $\frac{1}{2}$ in. Flowers white $\frac{1}{3}$ - $\frac{1}{2}$ in. diam., in many flowered sessile or shortly peduncled umbels; pedicels slender or filiform, $\frac{1}{2}$ - $\frac{3}{4}$ in.; sepals oblong or ovate; petals narrow, oblong. Ovary ovoid, pointed; gynophore $\frac{1}{4}$ - $\frac{1}{2}$ in. Fruit pisiform, black when ripe. Flowering time—February-May; "Rainy season"—says Kanjilal, in Upper India.

Uses :—Said by the Sanskrit writers to be useful in fevers caused by deranged bile and wind. Also considered alterative and tonic and useful in skin diseases (U. C. Dutt.)

The plant possesses febrifugal properties.

97. *C. horrida*, Linn. f. H.B.F.I., I. 178.

Syn. :—*C. zeylanica*, Roxb. 425.

Sans. :—Hunkaru.

Vern.:—Ardanda (H. Sindh. and Deck.), Ula-Kanta, bipuwa-Kanta (Kumaon); His, Karvila, hiungarna (Pb.); Karralurra (Oudh); Katarni (Gond.); gitoran (Ajmere). Burn asaria, Bagni, Bagnei Baguchi (Santal.); Bagrani (Monghyr); Oseriva (Uriya); Wâgatti, wâg, Tarti, Taranti (Bomb); gowindi (Mar.); Atanday, attandax, Katalli Kai (Tam.); Adonda, arudonda (Tel.).

Habitat:—Gangetic Valley, as far north as Saharunpore; Western Peninsula and Chittagong, Ceylon, Malaya and the Philippines.

A climbing shrub, with long divaricate branches, young shoots, with rufous scurfy tomentum. Leaves oval-lanceolate or oblong, obtuse, strongly apiculate, tomentose when young, afterwards glabrous and shining; petioles short, stipular spines recurved. Flowers rather large, $1\frac{1}{2}$ in. diam.; supra-axillary, solitary or 2 or 3 together, above one another, in a vertical line; peduncle $\frac{1}{2}$ – $\frac{3}{4}$ in., tomentose. Sepals rufous-tomentose outside. Petals twice as long, hairy. Stamens much longer than petals. Gynophore 1 in.; Ovary ovoid, apiculate, with 4 placentas. Fruit subglobose, $1\frac{1}{2}$ in. diam., on a greatly thickened stalk, many-seeded. Petals white, stamens crimson.

Parts used:—The leaves, root, and root-bark.

Uses:—In Northern India, the leaves are used as a counter-irritant and as a cataplasm in boils, swellings and piles (Atkinson.)

In Chutia Nagpur, the bark, along with native spirit, is given in cholera (Rev. A. Campbell.)

In Madras, a decoction of the leaves is used in syphilis. (Surg-Major Thompson). Watt II. 132.

The root-bark is sedative, stomachic and anti-idriotic; the leaves also slightly stomachic. The root-bark is useful in relieving some of the symptoms of gastric irritation, as vomiting and pain, and in improving appetite. It has also proved itself useful in a few cases of excessive perspiration, which it checked to a great extent. The leaves also possess the property of improving the appetite (Moodeen Sheriff).

N. O. VIOLACEÆ.

98. *Reseda odorata*, Linn. H.F.B.I., I. 181.

Habitat :—An English annual herb, cultivated in Indian gardens in the cold weather.

(Sweet-mignonette). Annual or perennial. Stems diffuse, of varying height, 1-2 ft., generally, clothed with bluntish lance-shaped leaves, entire or three-lobed. Flowers in long, loose, terminal racemes. Calyx 6-parted; petals creamy, finely cut into numerous divisions. Anthers red. Seeds numerous, in an ever open capsule.

(Favourite Flowers of Garden and Greenhouse by Edward Step, F. L. S., London, 1896. Vol. I., p. 65).

Use :—It is put to the same uses as violets.

Chemistry :—The root yields an oil, on distillation, which smells of radishes, has a light brown color, a sp. gr. of 1.067 at 15°, and a rotation of +1° 30' in a 100 mm. tube. This oil is phenylethylthiocarbamide, for, when heated with strong hydrochloric acid, it yields phenylethylamine hydrochlorids, carbon oxysulphide and hydrogen sulphide being evolved; phenylethylthiocarbamide is produced when it is heated with alcoholic ammonia. Diphenylethyloxamide melts at 186° and phenylethylthiocarbamide at 137°. (J. Ch. S. 1895, p. 218).

99. *Viola serpens*, Wall. H.F.B.I., I. 184.

Vern. :—Banafsha (H.); thungtu (Kumaon).

Habitat :—Moist woods, etc., throughout the temperate Himalaya, Khasia Hills, Pulney and Nilgiri Mountains, Ceylon.

A perennial herb, with a slender ascending root-stock, usually giving off long prostrate, glabrous, rooting branches. Hooker says: "Stolons and stems usually long, leafy and flowering." Leaves 1-1½ in., broadly cordate-ovate, acute or obtuse, crenate-serrate, more or less hairy on both surfaces; petioles usually longer than leaves, hairy, especially at the upper part; stipules free, fimbriate. Flowers ½-¾ in., nodding;

peduncle longer than leaf, slightly hairy; bracts setaceous. Sepals lanceolate, very acute. Petals oblong spreading; spur not inflated (Trimen); saccate. say Hooker f. and Th. Stigma oblique. Capsule $\frac{1}{4}$ in. long, globose or subglobose, pubescent, valve dehiscing irregularly. Seeds few.

Use:—This species also yields *Banafsha* of the Bazaars, and is considered to have medicinal properties similar to those of *V. odorata*. In the Punjab, a medicinal oil is prepared from it, called *raughan-i-banafsha*.

100. *V. odorata*, Linn. H.F.B.I., I. 184.

Vern.:—*Banafsha* (H.; Dec.; Bom.; Guz.); *Banosa* (Beng.); *Vayilethe* (Tam.)

Habitat:—Kashmir.

A glabrate or pubescent herb. Root-stock stout. Stem very short or 0. Stolons slender. Leaves tufted, in the Kashmir plant, $\frac{1}{2}$ -1 in. diam., broadly ovate-cordate, obtuse, crenate, tip rounded, nearly glabrous. Stipules entire or toothed, subulate, lanceolate. Sepals rounded at tip, very obtuse, spur nearly straight, short, cylindric, style inflated above; stigma decurved.

Parts used:—The flowers used dry.

Uses:—By the Mahomedan hakims, it is generally considered cold and moist, and is especially valued as a diuretic and expectorant, and as a purgative in bilious affections.

O'Shaughnessy experimented with the dry plant as a substitute for *Ipecacuanha*, but without success.

Moodeen Sheriff considers it antipyretic and diaphoretic, and very useful in relieving febrile symptoms and excitement in all forms of fever, particularly in combination with other drugs of the same class.

A certain amount of interest is attached to the leaves of the violet on account of an apparent improvement following the employment of the fresh infusion of the leaves in a case (L. '05, i. 713) in which it was alleged that a patient might have been suffering from malignant disease. A handful of the leaves was

soaked in a pint of boiling water for 24 hours and the liquid poured off, divided into 2 parts, 1 part being taken internally during the 24 hours, and the other used as a fomentation. An apparent recovery from a presumably malignant growth of the mouth resulted.

An examination of the leaves of the common violet (*viola odorata*) in the *Lancet* laboratory (L. '05, i. 1085) showed the presence of two crystalline bodies, one glucosidal and the other alkaloidal in character, and also a dark green oil. Alcohol was found a much more effective solvent than an aqueous menstruum; in view of the employment of an aqueous infusion, the latter point is of interest.

The alkaloid isolated behaved, chemically, much in the same way as Emetine, the principal alkaloid of *Ipecacuanha*. It has been stated (Y. B. P. '05, 467; C. D. '05, ii. 977; P. J. '05, ii. 869) that any activity which violet leaves possess is due either to the glucoside, the product of its decomposition, or a natural ferment associated with it. Reckoned as *violaquercitrin*, the glucoside from *Princess of Wales* violet leaves amounted to 5 p. c. of the weight of the fresh leaves. A fresh infusion was found to extract nine-tenths of the glucoside present in the leaves. No volatile constituent was isolated, no alkaloid could be detected, no salicylic acid was found. The presence of a glucoside was proved, but the glucoside was not isolated. Objection has been taken to the evidence of the uses of violet leaves having been unfortunately collected chiefly by unskilled persons, and that it has therefore been lacking in definiteness, and consequently in value. After the definite expression of the opinions mentioned in the above reference, it is disappointing to find in a paper read before the Therapeutical Society, October 30th, 1906, and reported in the *Lancet*, '06, ii. 1318, that all attempts to isolate and identify a glucoside from violet leaves have failed; similarly, there was no evidence of a ferment being present; the only positive facts resulting from the experiments being that the leaves and their preparations yield under certain conditions glucose.

It has been pointed out that the reputation of *Violets* for

the treatment of malignant growths was founded on the use of wild Violets, at least as far back as James I, and that it is therefore desirable that in any inquiry into the subject wild Violets should be used, such as have been used for centuries, and not a recent cultivated Violet, as employed at the present time. In the light of the above remarks, the varieties officinal in the Continental Pharmacopœias will be of interest. It will be noted that wild violets are officinal in the German and Swiss Pharmacopœias, and cultivated Violets in the Austrian.

(Peter Squire's Companion to the British Pharmacopœia, 18th edition (1908), pp. 1235-1236).

A syrup is made from the petals which is a favourite remedy for infantile disorders.

The root is a powerful emetic, and is frequently used to adulterate ipecac. A dose of from forty to fifty grains of the powdered root acts powerfully.

A principle called violine is present in all parts of the plant, analogous in external characteristics to the emetine of ipecacuanha, and possessing the same emetic properties. It is an alkaline substance, and forms salts by its union with acids; it is soluble in alcohol, but hardly so in water.

The flowers were used in olden times as remedies in many disorders, and were supposed to be especially serviceable to the eyes and in ague.

The seeds were formerly believed to counteract the effect of a scorpion's sting.

Syrup of violets is a favorite medicine for cough and hoarseness. The French make great use of violets in their *confitures* and household remedies; and we have seen and partaken of a delicate sweetmeat composed simply of the violet flower prepared with sugar, yet retaining its delicious perfume. (Sowerby's English Botany).

101. *V. cinerea*, Boiss, H.F.B.I., I. 185.

Vern. :—Banafsha (Sind. and Pb.)

Habitat :—Dry hilly region of the Punjab and Sindh.

A small herb. Stem short, glabrous 1-6 in., slightly powdery; diffuse-branched. Leaves elliptic-ovate or lanceolate, acute, obscurely crenate, $\frac{1}{4}$ - $\frac{1}{2}$ in., apiculate; petioles as long; stipules leafy fimbriate. Peduncles slender, bracts subulate. Flowers small, axillary, $\frac{1}{4}$ in. diam. Sepals lanceolate, aristate. Spur very short, secreting honey within it. Style clavate, compressed; stigma lateral of two oblong parallel discs. Fruit $\frac{1}{8}$ - $\frac{1}{4}$ in., elliptic, acute.

Use:—This plant is used medicinally in Sind, in the same way as *V. odorata*.

102. *Ionidium suffruticosum*, Ging, H.F.B.I.,
I. 185.

Syn.:—*Viola suffruticosa* and *V. enneasperma*, *Roxb.* 218.

Sans.:—Charati (Ainslie).

Vern.:—Ratanpuras (H. and Bomb.); Noonbora (B.); Suryakaiti; nilakobari; Pooroosharatanum (Tel.); Orilaihamaray, (Tam.); Oorelatamara (Malayal.); Tandi, Sol; bir Surajmukhi (Santal.).

Habitat:—From Bundelkhund and Agra to Bengal and Ceylon.

A glabrous or pubescent, very variable perennial herb, 6-12 in., branches diffuse, woody. Leaves linear or lanceolate, serrate-toothed, sub-sessile, $\frac{1}{2}$ -2 by $\frac{1}{12}$ - $\frac{1}{3}$ in., lower leaves broader. Stipules subulate, gland-tipped. Flowers solitary axillary, red. Pedicels shorter than the leaves. Sepals 5, subequal, not produced at the base. Petals variable, 4, oblong, acute or mucronate, the 5th with a claw and large oval or orbicular limb. Filaments distinct, bearing the anthers low down. Anthers free, 2 or 4 of them gibbous or spurred at the back, the two interior ones usually having a nectarial gland at the base. Ovary ovoid. Style clavate, incurved. Stigma oblique. Capsule 3-valved, sub-globose, few-seeded, valves, not elastic. Seeds globose, striate, testa crustaceous.

Parts used:—The leaves, stalks and root.

Use :—The leaves and tender stalks are demulcent, and are used by the natives in decoction and electuary; they are also employed in conjunction with some mild oil in preparing a cooling liniment for the head (Ainslie). The Santals employ the root in bowel complaints of children (A. Campbell). Dr. Moodeen Sheriff considers the drug to be demulcent and refrigerant and useful in some cases of gonorrhœa and of scalding of urine.

In the United States Dispensatory, it is stated that the root of a species of *Ionidium* has attracted some attention in the treatment of elephantiasis.

N. O. BIXINEÆ.

103. *Cochlospermum, Gossypium, D. C. H.F.B.I.,* 1. 190.

Syn. :—*Bombax gossypium*, Linn. Roxb. 515.

Vern. :—Kumbi, gabdi, ganiar, galgal, gangal (H.); Hopo (Santal.); Gulgal (Kol.); Gangam (Gond.); Kantapalas (Uriya); Kumbi (Pb.); Gajra, Kumbi (U. P.); Gungu, kong, gondugogu (Tel.); Tanku, Kongillam (Tam.); Bettatovare, arisina burga (Kan.); Chimapunji (Mal.); Ganeri (Bhil); Kadachogund (Guj.); Kalir-gond, kathalya gonda (Mar); Sisibaha, Udal (Chutia Nagpur). Katirê, (Hindi).

For the gum :—Nat-Ka-Katera, Nat-Ka-Katera-gond, (Deck.); Katera (H.); Tanaku-pishin (Tam.); Kondagogu-banka, Konda-gogu-pisunu (Tel.); Shima-pangi-pasha (Mal.)

For the cotton :—Pili-Kapas-Ki-rui, Katere-Ki-jhar, Kirin (Deck.); Tanaku-paruthi (Tam.); Konda-gogu-pathi (Tel.); Shima-pangi-paruthi (Mal.).

Habitat :—Dry hills, Garwal, Bundelkhund, Behar, Orissa and the Deccan; also commonly planted near temples.

A small deciduous tree, with a few short thick spreading branches. "Bark 1 in. thick, fibrous, deeply furrowed; inner substance red. Wood extremely soft, greyish-brown; no heart-wood. Pores large, scanty, often subdivided into compartments. Medullary rays broad, visible on a radial section as

long rough plates" (Gamble). Branchlets tomentose. Leaves near the ends of the branchlets, palmately 5-lobed, 4-9 in. diam., lobes shortly acuminate entire, grey-tomentose beneath, old leaves glabrous. Petioles slender, 4-6 in. Flowers 4-5 in. diam.; golden yellow in few-flowered terminal panicles. Sepals silky. Petals obovate, notched. Capsules pear-shaped, 3-4 in. long, 5-lobed. Flowers—February-April. Seeds covered with a kind of silk-cotton, called the "Kapok" fibres of India.

Parts used :—The gum and cotton.

Uses :—The gum has been proposed as a substitute for tragacanth. It is used in coughs, also in gonorrhœa (*Indian Medical Gazette*, 1875, p. 39).

In Patna, the dried leaves and flowers are used as stimulants. (Irvine, p. 78).

104. *Bixa Orellana*, Linn. H.F.B.I., I. 190.

Vern. :—Latkan, Watkana (H. and B.); Kong, Kuombi (Santal.); Jarat, Jolandhar (Ass.); Gulbas (Uriya); Powasi (Chittagong); Reipom (Manipur) Shal-ke-pandi-kâ-jhar (Deck.); Kisri, Kesari, Kesuri, Shendri (Mar. Bom.); Jupharachettu, Jafra vittulu-chettu, Kurungu-menjivittulu-chettu (Tel.); Japhramaram, Jafra-virai-maram (Tam.); Kuppamankala, Rangamali (Kan.) Korungoomunga (Mal.) Gowpurgee (H.).

Habitat :—Cultivated throughout India for the dye.

A large evergreen shrub or small tree. Bark brown, $\frac{1}{2}$ in. thick. Wood pinkish-white, soft, even-grained. Annual rings marked by a line without pores. Pores moderate-sized, in radial strings of 3 to 6, prominent on a vertical section. Medullary rays fine, closely packed, bent round the pores, or groups of pores, so that the distance between the rays is less than the transverse diameter of the pores (Gamble). Leaves simple, 4-8 by $2\frac{1}{2}$ -5 in., cordate, acuminate, glabrous. Stipules minute. Petioles slender, 2-3 in. Flowers in terminal panicles, bisexual, large, 1-2 in. diam.; pink or white; purple say H. f. and Th.; sepals 5, imbricate deciduous. Petals 5, contorted in bud. Anthers numerous, opening by two terminal pores. Ovary 1-celled; style slender, curved; stigma notched; ovules many,

on 2-parietal placentas. Capsule reddish brown, clothed with soft prickles, $1\frac{1}{2}$ in., ovoid or sub-globose, base intruded; dehiscence loculicidally 2-valved; placentas on the valve. Seeds many, covered with a red pulp (originally fleshy papillæ on the testa) which yields the well-known dye. Albumen farinaceous; Embryo large; cotyledons flat.

Parts used :--The seeds, seed-pulp and root-bark.

Uses :--Astringent and slightly purgative, also a good remedy for dysentery and kidney diseases. The pulp (a well-known colouring matter) surrounding the seeds is astringent (*Roxburgh.*). The seeds are cordial, astringent, and febrifuge (*Lindl.*).

The root-bark is antiperiodic and antipyretic, and the seeds slightly astringent and a very good remedy for gonorrhœa. The seeds also possess the antiperiodic and antipyretic properties, but to a less extent.

The root-bark is of great use in uncomplicated intermittent, remittent, and continued fevers. The seeds are very useful, particularly in the form of decoction. They are also useful in the above varieties of fever, but inferior to the root-bark in this respect.

The root-bark is one of those antiperiodic medicines, which can be used during the absence as well as the presence of pyrexia in the intermittent fever; and this remark is also applicable to the seeds as an antiperiodic (*Moodeen Sheriff*). The seed pulp is used by the American Indians to paint their body all over for full dress, and this use of it is said also to prevent mosquito bites.

105. *Flacourtia Cataphracta*, *Roxb.* H.F.B.I.,
i. 193. *Roxb.* 739.

Sans. :--Prachin-âmalaka.

Vern. :--Paniyala (B.); Talispatri (H.; Tel.; Tam.). Jaggam, Jan-Gama, Tâmbat (Bom.) Tâmbat (Mar.).

Habitat :--Nepal eastward, Bengal, Assam, Chitagong. The Konkan. S. India. Burma. Occasionally in Saharanpur.

Brandis describes this as a middle-sized deciduous tree. Whereas Kanjilal, writing about the same tree as found in the Sal Forests of Dun, says it is a small evergreen tree. Bark smooth. Wood hard, close-grained, reddish or orange-red, brittle. Stem armed with compound spines "up to middle age," says Kanjilal. Young shoots slightly pubescent. Leaves 3-5 in. long, ovate or ovate-lanceolate, long-acuminate, crenate, thin but tough, quite rounded. Petiole $\frac{1}{10}$ - $\frac{1}{8}$ in. long. Flowers deciduous, very small, in irregular glabrous racemes. Sepals hairy within, edges ciliate. Stigmas 4-6, capitate. Ovary flask-shaped, narrowed into a short cylindric or conical style. Fruit globose, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., purple when ripe, crowned by the persistent stigmas on peduncles, $\frac{1}{3}$ - $\frac{1}{2}$ in. long, very acid, dark purple when ripe. Stones 10-14, flat.

Parts used :—The leaves, shoots, bark and fruit.

Use :—The fruit is recommended as useful in bilious conditions and, like most acid fruits, it no doubt relieves the nausea and checks the purging (Dymock). The fruit is most delicious.

The leaves and young shoots taste like rhubarb, and are supposed to possess astringent and stomachic properties, and are prescribed in diarrhoea and weakness (Watt.)

The leaves are said to have diaphoretic properties.

106. *F. Ramontchi*, *L'Herit.* H.F.B.I., I. 193.
VAR. *Sapida*, *Roxb.* 739.

Sans. :—Swādu-kantaka.

Vern. :—Bilangra; bhanber; Kanju, handi; kattar; katti; bowchi (H.); Binka; Katai; Tambat (B.); Katail (Palamow); Serali; Mehlo Sarlarka (Kol.); Merlec (Santal.); Bonicha; Baili; Baincho (Uriya); Arma-Suri; Katien (Gond.) Kank; Kanki; Bilati (C. P.) Swadu-kantaka; Tāmbat; Kaikun; Pahr Bhekal Kakad (Bombay); Kanregu (Tel.). Gupra (Coorg).

Habitat :—In Southern India and Ceylon. Throughout the forests of the Sewalik Division, Mussoorie, and Malkot Hills, and the valleys of Jaunsar, from the Punjab Eastward,

Rajputana, Bihar, Central India, Dekkan and the Konkan and South Peninsula. In Manipur.

There are many varieties of this in India, north and south. The description given by Trimen of variety *Sapida* is about the best suited for the plant known in the Konkan.

The leaves of the Indian plant are deciduous. Gamble says they fall in January-February, and the new foliage appears in April and May. Flowers from March-November. In Ceylon, the flowering time is January and February. The trees growing in the forests of the Sewalik Division, Mussoorie, and Malkot Hills and in Jaunsar are deciduous; the bark whitish-grey, says Kanjilal. Trimen says it is a small tree, with long simple spinous twigs on the young branches and often large, compound, branched spines on the trunk. Bark rather smooth, grey; young shoots pubescent. Leaves 2-3 in., broadly ovate, acuminate, obtuse, acute at base, more or less crenate-serrate, glabrous or pubescent on the veins beneath, thin. Petioles $\frac{1}{4}$ in., often pubescent. Flowers small, in little few-flowered axillary raceme clusters; male flower sepals reflexed, ciliate; female flower sepals very small, ciliate; disk annular. Ovary globular; stigmas 5-6, nearly sessile, recurved. Berry globular, $\frac{1}{2}$ in., diam., pulpy, smooth, marked with scars of fallen stigmas. Fruit red or brown, dark inky, when ripe. Seeds 4-6, strongly lobulated.

Parts used:—The seeds, gum, bark and fruit.

Uses:—According to Sanskrit writers, the fruits are sweet, appetising and digestive. They are given in jaundice and enlarged spleen (U. C. Dutt.)

After child-birth among natives in the Deccan, the seeds are ground to powder with turmeric, and rubbed all over the body to prevent rheumatic pains from exposure to damp winds. (Dymock.)

The gum is given along with other ingredients for cholera.

The bark is applied to the body along with that of *Albizzia*, at intervals of a day or so during intermittent fever, in Chutia Nagpur (Revd. A. Campbell). The *Species* of *Albizzia* is not mentioned (K. R. K.).

107. *F. sepiaria*, Roxb. H.F.B.I., I. 194. Roxb. 739.

Vern.:—Kondai (H.); Sherawane, hargal, dajkar, jidkar khatai, kingaro (Pb.); Atruna; tâmbat (Bombay); Conrew, kana regu (Tel.); Sottacla (Tamil); Couron moeli (Malay.); Jootay Karoonday (Dec.); Bainch (C. P.)

Habitat:—Throughout Bengal, the Western Peninsula, notably in the north of Thana district, Ceylon.

A small, thorny shrub or tree. Bark yellowish-red, thin. Wood light red, hard, close and even-grained. Stem much branched, with the branchlets ending in sharp pointed rigid spines. Leaves 1-2 in., in fascicles, cuncate-ovate, or oblong, tapering to a petiole, very obtuse, more or less crenate-serrate, glabrous, stiff. Flowers yellowish diœcious, solitary or few, very small, in axillary racemose clusters shorter than the leaves. Sepals acute; pilose. Disk lobular, stigmas 3-4, very short, recurved, usually separate, on very short styles. Berry like a pea, globular, $\frac{1}{3}$ in., smooth, purple, acid-sweet when ripe, much appreciated, as it makes a refreshing drink with sugar and water. Thorns usually bearing flowers and fruit.

Use:—This tree yields an antidote to snake-bite from an infusion of the leaves and roots. The bark triturated in Sesamum oil, is used as a liniment in rheumatism (Wight; Ainslie; Rheede.) The ripe fruit, pea-shaped, is very savoury.

108. *Gynocardia odorata*, R. Br. H.F.B.I., I. 195.

Syn.:—Chaulmoogra odorata, Roxb. 740.

Vern.:—Chaulmoogra, Chhalmugra, Choulmungri (Hind.); Chaulmugri, petarkura (Beng.); Kadu (Nepal); Tuk-kung, (Lepcha); Chaulmugra (Bomb.); Tungpung (Magh.); Taliennœ, (Sing.); Brinjmogra (Pers.); Ta fung-tsze (Chinese).

Habitat:—From Sikkim and the Khasia hills eastwards to Chittagong.

A moderate-sized evergreen tree, perfectly glabrous, readily recognized by the hard round fruits which grow on the

stem and main branches. Branches slender and flexuous. Bark $\frac{1}{4}$ in., thick, grey, smooth. Wood hard, close-grained, yellow or light-brown. Pores very small, in radial lines. Medullary rays white, very numerous and prominent (Gamble). Leaves bifarious, coriaceous, oblong or linear-oblong, abruptly acuminate, quite entire, shining above; largest 6-10 by 3-4 in., strongly reticulate beneath; petiole $\frac{1}{4}$ -1 in. long. Flowers sweet-scented, yellowish, in large fascicles on the trunk, solitary or a few together in the leaf-axils, dioecious, very variable in size, $\frac{1}{8}$ -2 in. diam.; the females largest. Peduncles 1-3 in. Bracts basal, minute. Calyx coriaceous, cup-shaped, 5-toothed. Petals 5, with a ciliate scale at the base of each male flower. Stamens numerous, filaments woolly, anthers basifixed, linear. Female flowers: staminodes 10-15, villous. Ovary 1-celled, styles 5, stigma large, cordate; ovules numerous, on 5 parietal placentas. Fruit globose, 3-5 in. diam.; rind thick, hard, rough. Seeds 1 in. long, obovoid, immersed in pulp. Cotyledons flat, in oily albumen.

Uses:—It is officinal in the Indian Pharmacopœia. The oil has been very successfully used in leprosy.

"It has been very favorably reported on in many medical publications, especially as a remedy for leprosy, psoriasis, eczema, scrofula, phthisis, lupus, marasmus, chronic rheumatism, and gout. The preparations most in repute in Europe are the pure oil, gynocardic acid, and an ointment prepared from the oil." Perhaps the most satisfactory and trustworthy results have been those obtained in the treatment of chronic and acute eczema, and other forms of skin disease" (Watt.)

Prior to 1900 it was believed that the "chaulmoogra oil" was obtained from its seeds. But now it is known that, that oil is obtained from the seeds of *Taraktogenos Kurzii*. Chaulmoogra oil, at the ordinary temperature, is a solid (m. p. 22-23°) the oil from the seeds of *Gynocardia odorata* is a liquid. Furthermore, Chaulmoogra oil is optically active and consists chiefly of the glycerylestere of members of the Chaulmoogric acid series, whereas the oil from gynocardia seeds is optically inactive, and contains neither Chaulmoogric acid nor its homologues.

Gynocardia oil consists of the glycerylestere of the following acids:—(1) linolic acid, or isomerides of the same series, constituting the largest proportion of the oil; (2) palmitic acid, in considerable amount; (3) linolenic

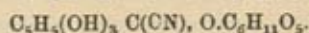
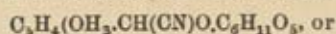
and isolinolenic acids, the latter preponderating; and (4) oleic acid, in relatively small amount.

In addition to the fatty oil, gynocardia seeds contain 5 per cent. of a crystalline glucoside, gynocardia, $C_{12}H_{19}O_9N$, $1\frac{1}{2} H_2O$, and a hydrolytic enzyme, gynocardase.

(Power and Barroncliff, Trans., Ch. S. LXXXVII, p. 896, et seq.)

Gynocardin, a new cyanogenetic glucoside. Power and Gornall have (shown Chem. Soc. Proc., 1904) that when the seeds of *Gynocardia odorata* are crushed and brought into contact with water, hydrogen cyanide is formed, owing to the presence in the seeds of a cyanogenetic glucoside, which was isolated and designated *gynocardin*. They have determined its constitution. Four Kilos of the powdered *gynocardin* seeds were first extracted with cold petroleum, for the complete removal of the fatty oil, and then with 25 per cent. alcohol. On expelling the alcohol from the extract, a dark syrupy residue was obtained, which soon formed a paste consisting chiefly of a crystalline substance; this was separated from the mother-liquor, digested for several minutes with warm ethylacetate, and again separated. A further quantity of the crude glucoside was obtained from the syrupy alcoholic mother-liquor, by first mixing it with "prepared saw dust," drying the mass and extracting it with ethylacetate, which slowly removes the glucoside. The crude glucoside was purified by dissolving it in water, treating the solution with animal charcoal, and evaporating under diminished pressure to a syrup, which set to a hard cake of colourless crystals which were dried on porous earthenware. The yield was 200 grams. Gynocardia forms colourless, glistening, prismatic needles of the composition $C_{13}H_{19}O_9N + 1\frac{1}{2} H_2O$; the water is expelled at $115^\circ C$. The anhydrous compound melts at 162° – $163^\circ C$, and has the optical rotation $(\alpha) D_{21} = +72.5^\circ$ in aqueous solution. It is readily hydrolysed at the ordinary temperature by *gynocardase*; an enzyme contained in the seeds, but only with difficulty by boiling with 5 per cent. hydrochloric or sulphuric acid. Dextrose and hydrogen cyanide were isolated from the products of the reaction, but the third substance, $C_6H_5O_4$, which should be produced, according to the equation:—

$C_{13}H_{19}O_9N + H_2O = C_6H_{12}O_6 + C_6H_5O_4 + HON$, is decomposed by secondary reactions. Gynocardin differs from other known cyanogenetic glucosides in its relatively great stability towards acid hydrolysing agents. It is hydrolysed by treatment with barium hydroxide solution, ammonia and the barium salt of *gynocardic acid* $C_{12}H_{19}O_9CO_2H$, being formed, according to the equation: $C_{13}H_{19}O_9N + 2H_2O = C_{12}H_{19}O_9CO_2H + HN_3$. This acid forms dextrose and an acid, $C_7H_{10}O_6$, on hydrolysis with acids. The results obtained indicate that gynocardia is the dextrose either of the cyanohydrin of a trihydroxy-aldehyde or ketone, in accordance with one of the following formulae:



The enzyme *gynocardase* was isolated by treating the finely-ground seeds with light petroleum to remove the fatty oil, and then digesting them with water at the ordinary temperature, for 24 hours. The filtered liquid was treated with twice its volume of alcohol, and after standing for some hours,

the precipitate was filtered off, washed with alcohol and dried in *vacuo* over sulphuric acid. The yield was two per cent. of the weight of the seeds. (J. S. Ch. I 31-5-1905, pp. 55-8).

109. *Hydnocarpus Wightiana*, Blume. H.F.B.I., I. 196.

Vern. :—Kowti (called कौटी in Rajapur, Ratanagiri District, whence the purest oil of seed, can be procured, Kadu-Kavata (Bomb.); Kosto (Goa); Maravettie (Tam.); Morotti, (Mal.); Jangli badam (seeds); Jangli badam ka tel (oil) (Dec.): Niradi-vittulu (seeds); niradi-vittulu-nune (oil) (Tel.)

Habitat :—Western Peninsula, from the S. Concan along the Coast range.

A tall tree. Wood whitish. Twigs usually brown, pubescent (rarely glabrate), as are the recemes. Leaves 4-9 by $1\frac{1}{2}$ -4 in., coriaceous or membranous, sometimes deeply obtusely serrate or toothed, elliptic or oblong-lanceolate, long, acuminate, base round, acute or subcordate. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. Flowers 1 in. diam., solitary or racemed, white, pentandrous. Sepals green, pubescent, 3 inner ones longer. Petals ciliate, twice as long as the ovate, fimbriate scales. Stamens villous at base, equalling the petals. Female flowers with imperfect stamens. Ovary densely pubescent. Fruit a berry, 2-4 in., of the size of a small orange, with a hard rind, many-seeded, tomentose. Seeds obtusely angular, embedded in pulp, testa crustaceous, striate. Albamen oily; colyledons very broad, flat.

Parts used :—The seeds.

Use :—The seeds have long been used as a domestic remedy upon the Western Coast, in certain obstinate skin diseases, ophthalmia, and a dressing for wounds and ulcers. The oil expressed from them is used in scabby eruptions mixed with an equal portion of *Jatropha curcas* oil, sulphur, camphor and lime-juice. For scald head, equal parts of the oil and lime water are used as a liniment. The oil has been recommended as a substitute for *Chaulmogra*, and is being used in the Bombay Presidency, with satisfactory results. In the Konkan also, the oil has a reputation as a remedy for *Bursati* in horses.

The fatty oil from its seeds very closely resembles Chaulmoogra oil, both in physical characters and in chemical composition. The acids obtained from the oil consist chiefly of Chaulmoogric acid and a lower homologue of the same series. This new acid has the formula: $C_{16}H_{32}O_2$ and is designated *hydnocarpic acid*.

Hydnocarpic acid crystallises from alcohol in glistening leaflets, melts at 60° and has $[\alpha]_D +68^\circ$ in chloroform solution. Like Chaulmoogric acid, it contains only one ethylenic linking, and, therefore, in consideration of its formula, $C_{16}H_{32}O_2$ ($C_nH_{2n-4}O_2$) must possess an alicyclic grouping.

(Power and Barrowcliff, Transactions, Ch. S. Vol. LXXXVII, p. 884 *et seq.*)

110. *Taraktogenos Kurzii*, King.

Syn.:—Hydnocarpus heterophyllus, Kurz.

Vernacular:—Kalanzo. (Burm.) (Gamble). Kalawaso (Burm.) (Brandis).

Habitat:—Eastern and Southern slopes of the Pegu Yoma, very frequent in Martaban; forests of Sylhet; Chittagong; Minbu district, Upper Burma.

An evergreen tree 40-50 ft. Shoots, young leaves and inflorescence tawny, pubescent. Leaves thinly coriaceous, entire, 7-10 in., lanceolate or oblong-lanceolate. Secondary nerves very prominent beneath, tertiary, numerous, transverse and parallel. Sepals 4. Petals 8, broadly ovate, ciliate, each with a flat, fleshy pubescent gland at the base. Stamens 24, free, filaments hairy. Fruit size of an orange, tawny, velvety. Seeds numerous, embedded in a pulp.

Use:—This is the tree which yields the Chaulmoogra seeds and oils of commerce, and not *Gynocardia odorata*, R. Br.

The seeds of *Taraktogenos kurzii* (King) and not of *Gynocardia odorata* yield the oil. The seeds contain a hydrolytic enzyme and also an unstable cyanogen compound, which reacts with the enzyme, when the seeds are crushed, giving rise to hydrogen cyanide. On expression, the seeds yielded 30.9 p.c. of a fatty oil, which had the following constants: m. pt., $22^\circ-23^\circ$ C; sp. gr., 0.951 at 25° and 0.940 at 45° C; $[\alpha]^{130}_D = +52^\circ$; acid value, 23.9; saponification value, 213; iodine value, 103.2. On hydrolysis, the fatty oil yielded glycerol, a very small amount of phytosterol, $C_{26}H_{44}.OH$ (m. pt. 132° C.) and a mixture of fatty acids (m. pt. $44^\circ-45^\circ$) $[\alpha]_D = +52.6^\circ$ in chloroform; acid value, 215; iodine value, 103.2, which consisted chiefly of several homologous acids belonging to a series $C^*H_{2n-4}O_2$ containing a closed ring and one ethylenic linking, no member of which has hitherto been isolated from a fatty oil. The highest of these homologues present, which was isolated in a pure con-

dition, separates from most of the usual organic solvents in glistening leaflets (m. pt. 68°C , b. pt. $247^{\circ}\text{--}248^{\circ}$) 20 mm., $[\alpha]_{\text{D}} = +56^{\circ}$ has the formula $\text{C}_{13}\text{H}_{22}\text{O}_2$, and is designated *chaulmoogric acid*. It combines with only two atomic proportions of bromine or iodine. Palmitic acid also was identified, and there is reason for assuming the presence of a near homologue or homologues of chaulmoogric acid, but belonging to the series having the general formula $\text{C}_n\text{H}_{2n-4}\text{O}_2$, with two ethylenic linkings. Undecylic acid and hydroxy acids were proved to be absent, and an individual acid corresponding to hypogæic acid, could not be isolated. The "gynocardic acid" of all previous investigators is believed to be a mixture of several substances. The "presscake" yielded, besides formic and acetic acids and a very small amount of volatile esters having the characteristic odor of the seeds, an appreciable amount of a neutral oily substance, $\text{C}_{13}\text{H}_{22}\text{O}_2$ (b. pt. $214^{\circ}\text{--}215^{\circ}$ 18 mm.; sp. gr., 0.9066 at $16^{\circ}/16^{\circ}\text{C}$., $[\alpha]_{\text{D}} = +42.4^{\circ}$) which is isomeric with chaulmoogric acid.

Mr. P. C. Chattopâddhyâya has analysed the seed and published his results in the *American Journal of Pharmacy* for 1915 pp. 473-483 of which the following is the Summary.

A SAMPLE of cold drawn oil from genuine seeds of *Taraktagenos Kurzii* (true chaulmoogra seeds) and an oil derived from supposedly genuine, but probably mixed seeds, by hot expression, were examined. The former was a pale yellow oil and remained liquid at 15°C ., whilst the latter was a brownish yellow buttery substance which was separated by filtration into about equal parts of a clear oil and a solid fat (chaulmoogra fat) before analysis. The following values were obtained:—

	Sp. gr. at 30° C.	Solidif. pt.	Maumené test.	Valenta test.	Acid value, calc. as oleic acid.	Saponif. value.	Hübl iodine value.	Acetyl value.	Saponif. value acetylated oil.	Ester value.
Cold expressed oil ...	0.9488	11.9° C.	86° C.	101° C.	11.18	226.36	96.5	19.1	423.07	204.26
Hot expressed oil ...	0.9471	21.5° C. & 27° C.	85.5° C.	Sol. in acetic acid.	44.39	217.57	105.4	39.9	268.2	129.27
Chaulmoogra fat ...	...	33° C.	...	Sol. in acetic acid.	59.16	228.3	105.3	...	...	110.6
Fatty acids from cold expressed oil.	...	37° C.	...	...	...	230.48	98.2	...	...	...
Fatty acids from hot expressed oil.	...	33° C.	...	...	...	236.9	111.6	...	...	...

These results indicate that the genuine oil consists almost wholly of triglycerides of lauric, chaulmoogric, and linolic acids, whilst the doubtful oil is a mixture of tri- and diglycerides.

On neutralising the oil with alcoholic potash and adding a dilute solution of calcium, magnesium, or zinc chloride, the corresponding metallic salt of "gynocardic acid" is precipitated. Calcium and magnesium "gynocardates" are white crystalline substances slightly soluble in boiling water and most soluble in boiling alcohol, whilst zinc "gynocardate" is white and crystalline, insoluble in water and only very sparingly soluble in boiling alcohol. 10 drops of the genuine oil stirred with 1 drop of sulphuric acid gave a yellow coloration, changing rapidly to reddish-brown and finally to dirty brown, whilst the doubtful oil gave similar colour changes, but the final coloration was olive-green, this reaction being also given by the fatty acids from both oils and by chaulmoogra fat.—J. Oh. I, Nov. 15, 1915.

But in the *American Journal of Pharmacy*, for 1915 (pp. 493—500), Mr. Frederick B. Power severely criticises the above paper.

He emphasizes the statement that chaulmoogra (*Taraktogenos*) oil and gynocardia oil are totally unlike, both in their physical characters and chem. compn. Along with data establishing the authenticity of his oils, Mr. Power gives the following: *Physical characters*: (1) chaulmoogra oil: soft solid at ordinary temp., m. $22-3^{\circ}$, d_{25} 0.951 and d_{45} 0.940, $[\alpha]_D^{25} +52.0^{\circ}$, acid value 23.9, sapon. value 213.0, I value 103.2, (2) Gynocardia oil: pale yellow liquid at ordinary temps., odor resembling that of linseed oil, d_{25} 0.925, acid value 4.90, sapon. value 197.0. I value 152.8. *Chemical composition*: (1) chaulmoogra oil: (from the seeds of *Taraktogenos Kurzii*, King), optically active, consists, to a large extent, of the glyceryl esters of optically active acids of an entirely new type, represented by the general formula $C_nH_{2n-4}O_2$, having a cyclic structure. The acid present in the largest proportion possesses the formula $C_{13}H_{22}O_2$, m. 68° , $[\alpha]_D +56^{\circ}$, and has been designated *chaulmoogric acid*, while a lower homolog, $C_{11}H_{20}O_2$, m. 60° , $[\alpha]_D +68^{\circ}$, has been termed *hydnocarpic acid*, on account of having first been isolated from a hydnocarpus oil (*J. Chem. Soc.* 87, 888 (1905)). Both of these acids are beautifully cryst. substances, from which a number of derivs. have been prepd., and their constitution has also been definitely established (*C. A.* 1, 1561, 2114). Inasmuch as acids of the above described type had hitherto not been known to occur in a fatty oil, they have been classified by Lewkowitch ("Chemical Technology and Analysis of Oils, Fats and Waxes") under the heading of "the chaulmoogric acid series." Chaulmoogra oil contains, furthermore, a relatively small proportion of palmitic acid and a phytosterol. (2) Gynocardia oil (from the seeds of *Gynocardia odorata*, R. Br.) is completely devoid of optical activity, contains none of the members of the chaulmoogric acid series, and has been shown to consist of the glyceryl esters of the following acids: (*cf. J. Chem. Soc.* 87, 896—900 (1905)); (1) linolic acid, or isomerides of the same series, constituting the largest proportion

of the oil, (2) palmitic acid, in considerable amt. (3) linolenic and isolinolenic acids, the latter preponderating, and (4) oleic acid, in relatively small amount. A phytosterol, m. 133°, was also isolated. Both the physical properties and chem. compn. of the above mentioned oil render it evident that the chaulmoogra oil of European commerce could never have been obtained from *Gynocardia* seeds. On the other hand, representative samples of commercial chaulmoogra oil have been found to agree closely in character with the oil expressed from genuine *Taraktogenos* seed, thus completely confirming, from the chem. side, the botanical observations of Prain (*Pharm. J.* 64, 522 (1900); 66, 596 (1901)) with respect to the source of chaulmoogra oil. *Gynocardia* seeds contain, besides the fatty oil, the cryst. cyanogenetic glucoside, gynocardin, $C_{13}H_{12}O_2N$, which has, likewise, been made the subject of a complete chem. investigation (*J. Chem. Soc.*, 87, 349-57 (1905); 97, 1285-9 (1910)). Mr. Power also notes that the total compn. of chaulmoogra oil, as given by Chattopadhyaya, is equal to 110%, which is obviously an error. Chemical Abstracts, Jan. 10, 1916 p. 89.

N. O. PITTOSPOREÆ.

111. *Pittosporum floribundum*, W. and A. H.F.B.I., I. 199.

Syn.:—*Celastrus verticillata*, Roxb. 209.

Vern.:—Tibilti (Nepal); Bongzam (Lepcha); Yekdi; Yekadi (Bomb.); Vehkali; Vikhari; Vehyenti; yekadi (Mar.).

Habitat:—Subtropical Himalaya, from Sikkim to Garwhal. Khasia hills and Mishmi; Western Peninsula, Concan to the Nilgiri.

A small evergreen tree, very handsome. "Bark very thin, light greenish-grey, with very prominent horizontal lenticels, up to nearly $\frac{1}{2}$ in. long. Wood white, moderately hard, close-grained. Pores small, often sub-divided or in strings, scanty or irregularly distributed. Medullary rays fine to moderately broad" (Gamble). Branches often umbelled, glabrous. Leaves pale beneath, margin waved, 4-6 in. (Brandis). 2-8 by 1-3 in. (H. f. and Th.), glabrous, shining, coriaceous, acute or acuminate, lanceolate or oblong-lanceolate. Flowers yellow, numerous, small, pubescent, in much-branched, terminal, compound, dense corymbs, sometimes leafy below; branches 1-3 in., spreading, glabrous or pubescent; sepals ovate, obtuse or acute, subciliate. Petals erect, claws connivent. Stamens

5, erect; anthers 2-celled, introrse, bursting by slits. Style glabrous. Ovary pubescent, sessile, incompletely 2-3-celled. Ovules 2 or more on each placenta. Capsule glabrous, $\frac{1}{4}$ in. diam.; pisiform, woody 2-rarely 3-valved; valves coriaceous, placentiform in the middle. Seeds 1-4, occasionally numerous, smooth, embedded in a pulp.

Uses:—The bark is bitter and aromatic, and is said by natives of the Western Ghats to possess narcotic properties. It is used in doses of 5 to 10 grs. as a febrifuge, and in doses of 50 grs., is believed to be a specific for snake poisoning; 5 to 10 grain doses of the dried bark given with benefit in chronic bronchitis. It is a good expectorant, but in one or two cases in which it was tried in Bombay, it gave rise to dysenteric diarrhoea (Pharmaco. Indica).

The late M. C. Periera of Bandra, an Assistant in the Bombay Medical Stores, used to prepare a tincture of the bitter bark. In exhibiting a specimen of the Tincture at the Therapeutical Section of the International Medical Congress of Australasia, held in Melbourne in January 1889, Surgeon Major K. R. Kirtikar said thus:—"The tincture contains a volatile oil which is said to act as an antiseptic and stimulant to the mucous membrane of the bronchi. The dose of the tincture is a drachm and a half, thrice daily in water or honey." (See p. 948, Proceedings of the Second Session of the Australasia Congress.)

In Travancore, half-a-teaspoonful doses are given internally in leprous affections, and the oil beaten up with the kernels and shells of castor oil seeds, is used as a remedy for itch, (Dymock.)

In physiological action, the oil is alterative, tonic, and a local stimulant, and appears also to have a specific effect on certain skin diseases. It has been recommended for trial as a local application in rheumatism, leprosy, sprains and bruises, sciatica, chest affections and phthisis, ophthalmia, and the various forms of skin diseases. Internally it may be prescribed in doses of from 15 minims to 2 drachms in cases of leprosy, various forms of cutaneous disease, secondary syphilis and

chronic rheumatism. It must, however, be employed with caution, as in certain cases it is said to act as a gastro-intestinal irritant, producing vomiting and purging (Watt.)

N. O. POLYGALACEÆ.

112. *Polygala crotalarioides*, Ham. H.F.B.I., I. 201.

Vern. :—Lil Kathi (Santali).

Habitat :—Common in Simla, in rock-crevices. Temperate Himalaya, from Chamba Hill to Sikkim, Khasia Mts.

A perennial, densely hairy herb. Rootstock woody, often tuberous. Stems thick, short, decumbent. Branches long, spreading. Leaves nearly sessile, ovate or oblong-ovate, $\frac{1}{2}$ -2 in. Bracts sessile. Flowers purple, crowded in axillary racemes. Calyx persistent. Keel-petal crested. Capsule heart-shaped, fringed. Seeds hairy. Strophiole, with 2 small ovate appendages.

Parts used :—The entire plant and the root.

Use :—Used medicinally by the natives in catarrhal affections; deserving of further attention. (Ph. Ind., p. 29.)

Royle states that the plant was sent to him with the information that the root was employed as a cure for snake-bite by the hill people of the Himalaya. This fact is of interest, since *P. Senega* is similarly used in South America (Watt.)

113. *P. chinensis*, Linn, H.F.B.I., I. 204.

Syn. :—*P. arvensis*, Willd; Roxb. 531.

Vern. :—Meradu or Miragu (H.); Gaighura (Santal.); Negli (Mar.) Pili Bhoysana (Guj. and Porebunder).

Habitat :—Throughout India, from the Punjab to Pegu, and in the Western Peninsula. In Porebunder State (Bardâ. Mt.)

An annual herb, most variable, usually procumbent, leafy, rather stout, 3-10 in. high, glabrous or pubescent.

Leaves excessively variable, $\frac{1}{3}$ -2 in. long, sometimes quite obcordate, at others almost orbicular, at times narrow, linear, rather thick and coriaceous, glabrous, ciliate, hoary or pubescent, margins usually flat, opaque. Racemes axillary and extra-axillary, much shorter than the leaves, truncate, almost capitate. Bracts persistent, at least till the flower expands. Flower $\frac{1}{5}$ - $\frac{1}{4}$ in. long. Wings longer than the sub-orbicular, notched, ciliate, narrowly winged, capsule green, falcate, obovate, acute; margins membranous; crest of corolla very small. Seeds silky, strophiole with 3 short appendages.

Part used :—The root.

Use :—In Chutia Nagpur, the root is given medicinally in cases of fever and dizziness (Campbell).

114. *P. telephioides*, Willd. H.F.B.I., I. 205.

Habitat :—Western Peninsula, Carnatic and Travancore.

An annual herb; stems very many from an annual woody root, prostrate, not exceeding 2-4 in. in height, pubescent. Leaves sessile, $\frac{1}{2}$ - $\frac{3}{4}$ in., margins usually recurved, glabrous, often imbricate, very thick, obovate or oblong, obtuse or acute. Bracts caducous before flowering. Flowers $\frac{1}{10}$ in. long, fascicled on very short, extra-axillary peduncles; outer sepals acute, wings herbaceous, oblique, acuminate. Capsule glabrous; not ciliate, $\frac{1}{12}$ in. broad and long, deeply notched; valves margined. Seeds minute, silky, strophiole minutely 3-appendiculate.

Use :—Used in catarrhal affections by the natives of Madras. (Ph. Ind., p. 29.)

N. O. FRANKENIACEÆ.

115. *Frankenia pulverulata*, Linn. H.F.B.I., I. 212.

Vern. :—Khareeya (Sindh.)

Habitat :—On the Sea Coast of Sind; also on the salt plains of the Punjab, and probably also in Cutch.

An annual herb, slender, prostrate, diffuse, exceedingly branched. Leaves obovate, retuse or hoary beneath, $\frac{1}{2}$ - $\frac{1}{4}$ in., very shortly petioled. Branches wiry, leafy, 6-18 in. long. Flowers pink, shorter than the leaves. Calyx cylindric, glabrous, strongly ribbed. Petals small.

Use:—Valued by native practitioners in the fresh state for its mucilaginous and aromatic properties; exhibited in the form of decoction in empyreuma (Murray.)

N. O. CARYOPHYLLÆ.

116. *Saponaria Vaccaria*., Linn. H.F.B.I.,
I. 217.

Syn.:—*S. perfoliata*, Roxb. 385.

Vern.:—Musna (Santal.; H.); Sabuni (B.).

Habitat:—In wheat fields throughout India.

An annual herb, tall robust, simple or sparingly branched, perfectly glabrous, 12-24 in. high. Leaves 1-3 by $\frac{1}{3}$ - $\frac{3}{4}$ in., acute, cauline, linear-oblong. Radical leaves oblong, cauline sessile, base rounded or cordate. Flowers erect in dichotomous cymes. Pedicels slender, more or less tubular, $\frac{1}{2}$ in., with 5 broad green nerves, ventricose in fruit. Calyx-teeth triangular, margins scarious. Petals short, obovate, rosy. Stamens 10. Styles two. Capsule included, broadly ovoid. Seeds large, globose, black, granulate.

Part used:—The sap.

Use:—The mucilaginous sap of the plant is used by the natives in the cure for itch (Murray.)

It is considered by natives to have febrifuge and tonic properties in long continued fevers of a low type (*S. Arjun*.)

The decoction of an allied species, *Saponaria officinalis*, has been employed both in France and Germany as an external application to the itch. It has also been given internally in gout, rheumatism, and some other disorders.

Saponaria officinalis contains a principle, called Saponine, which is white, amorphous, and has a taste first sweet, then styptic, and finally acrid.

It is a powerful sternutatory, and is soluble in water. The solution froths when agitated, like soap. When acted on by alkalies, saponine is converted into saponic acid. The detergent properties of the plant appear to depend on this substance (Sowerby's English Botany).

The Indian species does not seem to have been as yet chemically analysed.

117. *Polycarpæa corymbosa*, Lam. H.F.B.I.,
I. 245.

Vern.:—In Porebunder, it is called the small-leaved Okharād.

Habitat:—Throughout India, Ceylon, Burma. Found on Burda Mt., in Porebunder State (J. Indrajī).

An erect or decumbent annual or perennial herb. Stems 6-12 in., erect or ascending, much dichotonously branched; branches very numerous, wings diffuse, 4-10 in. long, spreading from the centre, hoary, tomentose or glabrescent. Leaves numerous, narrow, linear or subulate, pseudo-verticillate (in opposite clusters), $\frac{3}{4}$ -1 in., acuminate, acute or obtuse, much exceeding the stipules. Stipules lanceolate or subulate, scarious. Flowers crowded in conspicuous terminal dichotomous silvery cymes, $\frac{1}{6}$ in. Sepals somewhat unequal, 5, free with scarious white margins, shining white or coloured, narrowly lanceolate, $\frac{1}{10}$ in., very acute, keeled on the back, glabrous or pilose, much exceeding the petals and capsule. Petals 5, truncate, white, much shorter than the sepals. Style 1, tip 3-toothed. Capsule much shorter than the calyx opening by 3 valves. Seeds numerous, rough, pale-brown, small.

Use:—In Pudukota, used both externally and internally as a remedy for the bites of venomous reptiles (Pharmacographia Indica, Vol. 1, 158). In Porebunder it is similarly used as pounded leaves for bites from animals. Its pounded leaves are also used with molasses in the form of a pill in jaundice by the villagers of Porebunder.

The pounded leaves are also used over boils and inflammatory swellings, as poultice, warmed or cold (J. Indrajī).

N. O. PORTULACEÆ.

118. *Portulaca oleracea*, Linn. H.F.B.I., I. 246, Roxb. 391.

Sans. :—Loni.

Vern. :—Khursa, khurfa, kurfe-ka-sag, lonia, muncha, lunia, kurfa, munya, kulfa lunuk, nonkha, chhota-lunia, baralunia, luniya-kulfah; Seeds=khurfe-ke-bij (Hind.); Baraloniya, munya, chhotalunia, kulfi; Seed=tukhm-kulpha, baraloniya-bij (Beng.); Püruni-sag (Uriya); Mota uric alang (Santal.); Luniya, nunia lunak, desi-kulfah (U. P.); Luniya-kulfah, lunak (Kumaon); Lonak, kulfa, luniya, kundar; Seeds=dhamni (Pb.); Murlai, tursbuk, warkharai (Pushtu); Lonak (Sind.); Ghol, gholu, (C. P.); Kurfah, gol, moti ghol (Bom.); Bhuigholi (Mar.); Loni (Guz.); Khulfe-ki-bhaji; Seeds=khulfe-ke-binj (Dec.); Parpu-kire, passelie kiray, caril-kiray, parupu, puropu-kiray, caric-kiray: Seeds=parpu-kire virai, pedda-pail-kuru, boddu-pavili kura, ganja-pavili-kura, batchali aku: Seeds=pappukura-vittula, pedda-pavila-kura vittulu, boddu-pavili kura-vittulu, (Tam.); Pappu-kura, pedda-pavili-kura, boddu-pavili-kura, ganga-pavili-kura (Tel.); Duda gorai (Kan.); Korie chira (Malay.); Kourfa kara-or, baqlatul humqa, buklut-ul-kukema, khurfa. Seeds=bazrul-baqlatul humqa (Arab.); Cholza, khurfah, turuk, kurfah, kherefah, turk: Seeds=tukhme-khurfa (Pers.).

Habitat :—Throughout India, in all warm climates. Found in the Himalaya. An abundant weed, in cultivated grounds, throughout Ceylon.

A short annual herb, with stout, glabrous, numerous, prostrate or ascending subsucculent branches, $\frac{1}{2}$ -1 ft. Leaves alternate, $\frac{1}{4}$ -1 $\frac{1}{2}$ in., rounded-truncate, crowded beneath the branches, oblong spathulate, very obtuse, thick pale and glistening beneath. Petiole very short. No stipular appendages. Inflorescence of few-flowered terminal heads, either solitary or in dichotomous cymes. Flowers sessile, inconspicuous, with a few ovate, pointed, scarious scales. Petals 4-5, yellow, about

equalling the sepals, very delicate or soon falling off or 0. Stamens 8-12. Style 3-8-fid. Capsule dehiscent transversely, inclosed in sepals, the free portions of which also separate by transverse division and come away with the lid. Seeds numerous, muricate, dark brown. The flowers are yellow and open only for a few hours in the morning. Flowers all the year round.

Parts used:—The plant, leaves, and seeds.

Uses:—The plant has long been used as a domestic remedy by the Hindus, and was early noticed by European writers. Ainslie writes thus of *P. quadrifida* which possesses the same properties:—"The bruised fresh leaves of this acid and pleasant-tasted purslane are prescribed by the Tamool practitioners as an external application in *akki*, erysipelas; an infusion of them is also ordered as a diuretic in dysuria, to the extent of half-a-tea-cupful twice daily." He further mentions that in Jamaica, *P. oleracea* is employed as a cooling and moistening herb in "burning fevers." Bruised, it is applied to the temples to allay "excessive heat" and pain, and that the juice is "of use in spitting of blood." Dymock says that both species are supposed by Arabian and Persian writers to be cold and moist, and to have detergent and astringent properties. The plant and seeds are recommended by them in a great many diseases of the kidneys, bladder, and lungs, which are supposed to be caused by hot or bilious humours. They are also praised as an external application in burns, scalds, and various forms of skin disease (*Mat. Med., W. Ind.*). Moodeen Sheriff describes the seeds as demulcent, slightly astringent, and diuretic; the leaves as refrigerant, astringent, diuretic, and emollient. He believes, both to be "very useful" in some cases of strangury, dysuria, irritation of the bladder, hæmaturia, hæmatemesis, hæmoptysis, and gonorrhœa. "In addition to this," he writes, "the seeds seem to have some beneficial influences over the mucous membrane of the intestinal canal, and therefore relieve tormina, tenesmus, and other distressing symptoms in many cases of dysentery and mucous diarrhœa. This is particularly the case when they are combined

with some other drugs of similar nature." He recommends the fresh succulent leaves as a cooling external application in the place of ice or cold lotion. The seeds and juice of the fresh leaves may be best administered in the form of a draught, from thirty grains to one drachm of the former, and from one to two fluid ounces of the latter (obtained by pressing the leaves) being the dose. He recommends either of these as substitutes for spirits of nitrous ether, Pareira-brava, tragacanth, elm-bark, rhatany, copaiba, and ice.

By Natives generally at the present day, the herb is chiefly valued as a refrigerant and alterative pot herb, particularly useful as an article of diet in scurvy and liver disease. In addition to the properties above detailed, the seeds are believed in the Punjab to be vermifuge.

The juice of the stems may be applied with advantage to prickly heat, as well as to the hands and feet when a burning sensation is felt.

119. *P. quadrifida*, Linn., H.F.B.I., I. 247.

Syn.:—*P. meridiana*, Roxb. 391.

Sans:—Laghu Lonika

Vern.:—Chounlayi, loniya, khate chawal (Hind.); Nuniya, chhota lunia (Beng.); Lunak, haksha, lunki-buti (Ph.); Kota, chaval-ke-bhaji, barika, ghola (Bomb.); Luni (Guz.); Rân Ghol (Mar); Choulayi-ki-bhaji, ghol-ki-bhaji, chowli (Dec.); Soin-parpu-kirai, pasarai-kirai, siru-pasarai-kirai, passeli-kirai (Tam.); Sanna-pappu, sanna-pavili, goddu pavili, pedda pavili, sunpail kura, pavili, kura, payalaku, sanna payala (Tel.); Hali bachcheli (Kan.); Hin-gende-kola (Sing.); Baqlatul-yamaniah, baqlatul-aarabbiyah budelut-ul-mobarik (Arab.)

Habitat:—Throughout the warmer parts of India.

A diffuse, annual, succulent herb. Stem filiform. Rooting at the nodes; nodal appendages pilose, more or less copious. Leaves flat $\frac{1}{8}$ - $\frac{1}{2}$ in., opposite, very shortly petioled, ovate or ovate-lanceolate. Flowers terminal, solitary. Calyx-tube $\frac{1}{2}$ -immersed in the extremity of the axis, surrounded by a four-leaved involucre, and long silky hairs. Petals 4, yellow;

stamens 8-12 (Hooker); anthers two-celled. Style filiform, 4-fil. to the middle. Ovary half-adnate. Fruit a capsule dehiscing transversely. Seeds minutely tubercled, compressed.

Parts used :—The leaves and seeds.

Uses :—The leaves are similar to those of *P. oleracea*. The seeds also possess identical qualities to those of the former species.

120. *P. tuberosa*, Roxb. H.F.B.I., I. 247. Roxb. 391.

Vern. :—Loonak (Sind.); Dhamnee—the seed; Bodda kura (Tel.)

Habitat :—Behar, Sind, the Punjab, and the Western Peninsula.

A diffuse, succulent, perennial herb. Root tuberous, 2-3 in., slightly fusiform. Stem short, 2-3 in., spreading from the root, with a few branches towards the extremity, villous. Leaves $\frac{1}{2}$ - $\frac{3}{8}$ in., alternate, fleshy, linear; nodal appendages $\frac{1}{8}$ in., of sparingly tufted brown hairs. Flowers yellow, in small terminal clusters, surrounded by about 8 leaves and tufted hairs. Stamens 20. Style filiform, 5-cleft. Seeds black, granular.

Use :—The fresh acid leaves are used medicinally; an external application is prescribed by native practitioners in erysipelas and an infusion in dysuria (Murray, 96)

N. O. TAMARISCINEÆ.

121. *Tamarix gallica*, Linn., H.F.B.I., I. 248.

Syn. :—*T. Indica*, Willd.

Sans. :—Jhāvooka, Shāvaka.

Vern. :—Jhāu (H. & B.); Jhāv-nu-jhāda (Guz.); Pilchi, Koa; rukh; lainya; jhau; lai (Ph.); Atru-shavukhu-maram (Jain); Eru-saru-manu (Tel.); Ler, lai, jhau (Sind.).

The galls :—Baramāi; barri mām (H.); Magiya mām. (Bomb.)

The manna:—Gazangabin and Gazanjabin (Arab., Pers., and Bomb.)

Habitat:—Throughout India, near rivers, and along the sea-coast.

A glaucous, gregarious, small tree or shrub. Bark rough greenish-brown, that of young branches reddish-brown, smooth, with small whitish specks. Wood whitish, occasionally with a red tinge, open and coarse-grained, fairly hard and tough, but not strong. Pores small and moderate-sized, numerous, more so in spring wood. Medullary rays numerous, broad, but short (Gamble). Annual rings distinct (Brandis). Leaves minute, not sheathing, apex acute, patent or loosely appressed. Flowers mostly bisexual, pentamerous, white or pink, crowded in long slender spikes, collected in dense panicles at the ends of branches and forming a large irregular mass of flowers. Bracts shorter than flowers. Disk slightly 5-or 10-crenate; filaments not dilated at base; styles short, stigma often almost sessile. Capsule $\frac{3}{8}$ in. long, more than twice the length of the withered sepals supporting it. Flowering time, August to February (Brandis).

Parts used:—The galls and manna.

Uses:—The galls are employed medicinally by the natives as an astringent. Dr. Stocks speaks highly of the astringent properties of the galls, and from personal experience recommends a strong infusion of them as a local application to foul, sloughing ulcers and phagedenic buboes. By the natives they are also administered internally in dysentery and diarrhoea (Ph. Ind., p. 29.)

The Hakims consider the manna to be detergent, aperient and expectorant (Dymock.)

122. *T. dioica*, Roxb., H.F.B.I., I. 249, Roxb. 274.

Sans.:—Pichoola.

Vern.:—Lei; pilchi (Pb.); Gaz., lao (Sindh.); Lal-jhau (B. & H.).

Habitat:—From Sindh and the Punjab to Assam and the Western Peninsula, near and in the bed of rivers, and on the sea-coast.

A gregarious glaucous shrub or small tree. Bark, with reticulate cracks showing the red inner bark. Wood moderately hard, outer portion white. Pores small to moderate-sized in groups or short radial lines, more abundant and larger in the spring wood. Medullary rays very prominent, short, fine to very broad, very prominent on radial section. The distance between the rays is generally three or four times the transverse diameter of the pores. The tree gives a gum of bitter sweet flavour (Gamble). Leaves sheathing, sheath tubular, apex acuminate, closely appressed, with a broad white margin. Flowers dioecious, pentamerous, purple or light pink, in stiff compact cylindrical pedunculate spikes often forming loose panicles at the ends of branches. Bracts as long as or nearly as long as the flowers. Male flowers: stamens alternating with the 5 lobes of the fleshy disk, anthers distinctly apiculate. Female flowers: 5 thin linear staminodia; styles filiform, thickened at the end, longer than the ovary. Capsule $\frac{3}{16}$ in. long, about twice the length of the withered sepals and petals at the base.

Use:—The twigs and galls are used in medicine as an astringent (Stewart).

123. *T. articulata*, Vahl., H.F.B.I., I. 249.

Syn.:—*T. orientalis*, Forsk.

Vern.:—Faras, farwa, marlei (Pb.); Asrelei (Sind). The galls:—Choti-mâin (H.); Magiya-mâin (Bomb.); Lal-jhâu (B. & H.)

Habitat:—Sind and the Punjab.

A moderate-sized tree, with an erect trunk, frequently 6-7 ft. in growth. Bark grey, rough; wood white moderately hard. Annual rings indistinct. Pores moderate-sized, often in groups or sub-divided, or singly between the medullary rays, scanty. Medullary rays short, fine to very broad, the distance between the rays somewhat greater than the transverse diameter of the groups of pores; prominent on a radial section as irregularly-shaped plates, giving the wood a handsome silver grain (Gamble). Branchlets articulate at base of sheath, often grey with saline efflorescence. Leaves sheathing, sheath $\frac{1}{10}$ in. long,

obliquely truncate, apex triangular, acute, adpressed. Sheath and apex with impressed glands. Flowers bisexual or monœcious, loosely scattered on long slender spikes which are generally collected at the ends of branches in loose panicles. Bracts shorter than flowers; stamens 5. Disk entire or indistinctly 5-lobed. Capsules $\frac{1}{8}$ in. long. Flowering time, May to September. The extremities of branchlets and the leaves on older branchlets are shed during the cold season; new shoots and leaves come out about May.

Parts used :—The bark and galls.

Uses :—The galls are employed as an astringent (Royle). The bark is bitter, astringent and probably tonic. (Ph. Ind., p. 20.)

The bark powdered and, in combination with oil and *Kamala*, is used as an aphrodisiac by the natives. It is also employed as an application in eczema capitis, and other diseases (Watt).

124. *Myricaria elegans*, Royle., H.F.B.I., I. 250.

Vern. :—Humbu? Umbu (Pb.)

Habitat :—Western Himalaya from Garwhal to Ladak.

A bush, with smooth, striate slender stem. Leaves oblong-ovate or oblanceolate, narrowed at the base, often crowded. Bracts, ovate, about twice as long as the pedicels, but short acuminate, with narrowly membranous margins. Flowers 3 in., lateral lax; white (Brandis.) Sepals connate below, much shorter than petals, obtusely triangular at apex. Stamens connate for one-fourth of their length, 10, alternately long and short, monadelphous. Ovary tapering, with 3 sessile stigmas; placentas basal, very short, adnate to the middle of the valves; ovules many. Seeds exalbuminous, with a usually stalked plume. Embryo ovoid.

Use :—The leaves form an application to bruises, &c., in Lahoul (Aitchison).

N. O. HYPERICINEÆ.

125. *Hypericum patulum*, Thunb., H.F.B.I., I. 254.

Vern. :—Tumbul (Behari).

Habitat:—Throughout the Temperate Himalaya (Sikkim excepted), from Bhotan to Simla and Chamba; also in the Khasia Mountains and Yunnan.

A shrub. Leaves distichous, $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, narrowed rhomboid or elliptical, very shortly petioled, black-dotted and rusty beneath; margins reflexed. Flowers 1 in. diam. Sepals $\frac{1}{2}$ in. Petals yellow, orbicular or elliptical, longer than the stamens. Styles equalling the ovary, but exceeding the stamens. Capsules obtusely conical, $\frac{1}{3}$ - $\frac{1}{2}$ in. long.

Dr. Hooker writes in the *Botanical Magazine*, for February 1st, 1868:—

"It is a native of Japan, where it was discovered by Thunberg ninety years ago, * *. As a species, it is very nearly allied to the *H. uralum*, Hamilton, of Nepal, and will probably prove to be a large-flowered variety of that plant. It is very variable in the foliage, which is flat or has recurved margins, and is green or rust-coloured beneath."

Part used:—The seed.

Use:—The scented seeds are employed as an aromatic stimulant in Patna, where they are imported from Nepal (Irvine).

126. *H. perforatum*, Linn., H.F.B.I., I. 255.

Vern. :—Balsant, dendlu (H. & Pb.)

Habitat:—Temperate Western Himalaya, from Kumaon to Kashmir.

A perennial herb. Stems erect, 2-edged, 18 in., with slender stolons branched above. Leaves oblong or ovate, pellucid-punctate, $\frac{3}{4}$ in., obtuse, with radiating veins, paler beneath, with black dots. Cymes corymbose, 3-chotomously branched; flowers 1 in., sepals $\frac{1}{2}$ in., 5, linear, acute connate; 3-delphous at the base; margins of the sepals eglandular. Petals persistent with black glandular edges. Ovary 3-celled; styles twice the

length of the ovary, equalling the stamens. Capsule $\frac{1}{2}$ in., egg-shaped.

Parts used :—The leaves and the whole plant.

Use :—It is recommended in Arabian medicine as a vermifuge, also used to cure piles, prolapsus uteri et ani (Honningberger, Vol. II., p. 289. The herb is bitter and astringent, and was recommended by Arabic writers as a detersive, resolute, anthelmintic, diuretic and emmenagogue and, externally, as excitant, but it does not appear to be used in modern medicine (Watt).

The plant is certainly astringent and aromatic; taken internally, it occasionally acts as a purgative, but not powerfully. In country districts, it is sometimes used still as a medicine, and oil, in which the shoots or flowering tops have been steeped, is sold by herbalists as “oleum hyperical.” The leaves have been used as a vermifuge (Sowerby's English Botany).

N. O. GUTTIFERÆ.

Garcinia Mangostana, Linn., H.F.B.I., 1. 260, Roxb. 441.

Vern. :—Mangustân (Bomb.); Mengkop (Burm.).

Eng. :—The Mangosteen.

Habitat :—Cultivated in some parts of the Madras Presidency, as at Barliyar in the Nilghiri Hills; Tenasserim. Malay Peninsula (doubtfully wild) Gamble says it has never been successfully grown in Northern India as it requires, a very hot, moist and uniform climate. “Home unknown; cultivated in moist regions of tropical Asia” (Brandis). Found in Cochin-China, Java, Singapore.

An evergreen, small, conical tree, 20-30 ft., glabrous. Branches many and decussate. Under favourable circumstances, says Brandis, the tree attains 60ft. and more. “Bark dark brown or almost charcoal-black, inner bark yellowish. Wood brick-red, hard. Pores moderate-sized, scanty, single or in small groups surrounded by loose tissue, the groups very irregularly

run together into more or less concentric patches, sometimes long and continuous, more often subdivided. Medullary rays moderately broad, not very numerous, of the same colour as the patches" (Gamble). Leaves thickly coriaceous, 6-10 in. by 2½-4½ in.; nerves regular, close inarching, with an intramarginal one; numerous, parallel "alternating with shorter intermediate nerves (Brandis). Petiole short, thick. Flowers tetramerous, "bisexual, solitary or in pairs at the ends of branchlets, 2 in. diam." (Brandis). Male flower in 3-9-flowered terminal fascicles; pedicels short. Sepals orbicular, concave, persistent. Petals broad, ovate, fleshy; yellow, red or purple. Stamens surrounding the rudimentary ovary in four masses; indefinite; filaments slender, flat at the base and sometimes connate, anthers ovate-oblong, 2-celled. Hermaphrodite flowers, 2 in. diam., solitary or germinating at the tips of young branches; pedicels ½ in., thick, woody. Sepals and petals as in the Male. Stamens many, filaments slender, connate below. Female flower:—Ovary, 4-8-celled, stigma sessile, thick 5-8-lobed, ovate, solitary. Fruit, a berry as large as an orange, globose, smooth, dark purple; pericarp or rind firm, spongy, thick, full of yellow resinous juice. Seeds large, flattened, embedded in snowy-white, or pinkish delicious pulp, which is botanically called the aril. This pulp it is that gives the fruit its value as one of the finest fruits of the Eastern Tropics, and one of the most highly appreciated, delicious products of the Eastern and Western Hemispheres. Flowers from November to February. Fruit ready in May and June. Pierre has examined more than 1,500 Mangos-teen trees, without finding a single male flower. But he adds that several species produce male flowers when young, and female flowers at a later age. (Brandis).

I have seen a tree of this in the Dapoli English Church (Mission)—K. R. K.

Parts used:—The rind, fruit, bark and leaves.

Use:—The rind is used as an astringent medicine for diarrhoea and dysentery. It has been found very useful in chronic diarrhoea in children by Waring and others. (Ph. Ind., p. 31.)

It has also been used as a febrifuge (Dymock).

According to Rumphius, the bark and young leaves are employed by the Macassars in diarrhoea, dysentery and affections of the genito-urinary tracts, and also as a wash for aphthæ of the mouth.

In exhibiting before the Melbourne Medical Congress of January 1889, a powder and a liquid extract of mangosteen from the fruit-rind prepared by the late Mr. M. C. Periera of the Bombay Medical Stores, Surgeon Major Kirtikar said thus :—"The value of these preparations lies in the yellow resin which the rind of the fruit contains a character of the fruits of the Guttifers. The resin acts like all other resins as a stimulant to the intestinal canal. I am not sure whether the crystallisable substance, mangostine, which Schmidt has obtained from the rind, has any particular therapeutic property. It is worthy of a trial, as the preparations are largely used by the Natives of Western India in chronic cases of the intestinal canal. Waitz recommends a decoction of the powdered rind as an external astringent application. I have no doubt that the resin adds to the value of this local remedy, by mechanically constricting the parts gently—an effect very often produced by uniform light bandaging." (Congress Proceedings, p. 948).

A strong decoction has also been recommended as an external astringent application (Watt.)

The fruit is said to have come into use of late years in European medicine as a substitute for Bæl (Watt.)

Mangostin (A) occurs in all parts of the Mangosteen tree. The dried fruit-skins contain about 5% each of a crystalline resin (A) and non-crystalline resin. (A) was first isolated by Schmidt, who assigned the formula $C_{20}H_{22}O_5$. (A) has the typical resin properties, burning with a smoky, luminous flame, causing friction and vibration when rubbed between the fingers, and dissolving in alkalis, alc., Et_2O , and many other solvents. (A) was obtained by concg. the alk. ext. of the dried skins *in vacuo*, shaking the syrupy residue with H_2O , and dissolving the dried insol. portion in warm PhH containing a little Et_2O . Recrystd. repeatedly from alc. containing a little H_2O , it forms flat, pale yellow needles, m. $181-2^\circ$. The analyses and mol. wt. detns. in PhOH and $(CO_2Me)_2$ gave results agreeing with $C_{23}H_{24}O_6$. (A) is insol. in carbonates, dissolves in alkalies with a red color, and is reprecipitated by CO_2 and acids and gives a greenish brown color with $FeCl_3$. It contains 1 MeO and 2 phenolic OH, the latter being shown by titration and by the action of Me_2SO_4 and dil. aq. KOH, which yield dimethyl-mangostin, $C_{25}H_{28}O_6$, faintly yellow,

silky needles, m. 123° . (A) and warm HNO_3 gave $(\text{CO}_2 \text{H})_2$, even when HOAc was used as diluent. Concd. KMnO_4 also gave $(\text{CO}_2 \text{H})_2$. Fusion with 5 parts KOH at about 250° gave a volatile oil with the odor of AmOH. The aq. soln. of the fusion was acidified and extd. with Et_2O , yielding BzOH, isolated as the Ca salt. In another expt. the aq. soln. of the fusion was satd. with CO_2 , shaken out with Et_2O and then with alc., which did not mix with the soln. The alc. soln. containing K salts was evapd., acidified with H_2SO_4 , and distd. with steam. The resulting volatile acids were purified through the Ba and Na salts, and finally sepd. as the Ag salts. HOAc and $\text{C}_4\text{H}_9\text{-CO}_2\text{H}$ were found. Boiled with HI for 12 hrs., (A) yields a substance, $\text{C}_{22}\text{H}_{22}\text{O}_6$, faintly yellow, silky needles, m. $180\text{-}1^{\circ}$, changes into short rhombs with identical properties on standing overnight in the mother-liquors when crystd. from alc., gives a deep green color in alc. with FeCl_3 ; its methyl derivative, prepd. with Me_2SO_4 and aq. KOH containing a little alc. to facilitate soln. m. 216° ; the monoacetyl derivative, using Ac_2O and NaOAc., m. $218\text{-}9^{\circ}$.—*Chemical Abstracts*, Aug. 10, 1915; p. 2061.

128. *G. indica*, Chois., H.F.B.I., 1. 261.

Syn.:—*G. purpurea*, Roxb. 443.

Vern.:—*The fruit*, Amsul, Kokam (Bomb.); Brindad (Goa); *the oil*, Kokam tel (Bomb.); *the bark*, Ratamba-sal, (Bomb.); Murgal mara (Tam.).

Habitat:—Western Peninsula, ghats of Concan and Canara.

A slender tree with drooping branches, branchlets black. "Bark light brown, rather shining, very thin, smooth. Wood greyish white, hard; many dark concentric lines, resembling annual rings, without or with very few pores; very numerous, narrow, anastomosing white brands, in which the scanty moderate-sized pores appear. Medullary rays moderately broad, white, regular" (Gamble). Leaves red, when young 2-4 in., thickly membranous, lanceolate, occasionally oblanceolate, nearly sessile, mucronate, rarely obtuse. Secondary nerves slender, 6-10 pair, a few shorter, very slender; intermediate nerves between. Flowers tetramerous, small. Sepals orbicular, outer small petals rather smaller. Male flowers: a central, round or 4-sided mass with crowded, numerous, 2-celled anthers; in terminal 3-7-flowered, often pedunculate cymes; pedicels $\frac{1}{4}$ in. long. Anthers numerous, 2-celled on short filaments crowded on a

central hemispherical receptacle. Hermaphrodite flower: solitary. Stamens 10-18, in 4 bundles alternating with petals. Female flowers solitary, terminal, shortly strictly peduncled. Ovary 4-8-celled; stigma 6-7—radiate, each ray with 2 lines of tubercles. Ovary 5-7-celled, says Brandis. Fruit globose, as long as a small orange, purple, not grooved. Seeds 5-8, embedded, compressed in a reddish acid pulp. Flowering time, November-February. Fruit ready, April-May.

Parts used:—The fruit, seeds, and bark.

Use:—The Apothecaries of Goa prepare a very fine purple syrup from the juice of the fruit, which is used in bilious affections. The bark is astringent, and the young leaves, after having been tied up in a plantain leaf and stewed in hot ashes, are rubbed with cold milk and given as a remedy for dysentery (Dymock.)

The oil of the seeds is officinal in the Indian Pharmacopœia for the preparation of ointments, suppositories and other pharmaceutical purposes. It has been used as a local application to ulcerations, fissures of the lips, hands, &c. (Ph. Ind., p. 31.)

Regarding the oil, Modeen Sheriff writes:—"I have used it internally in my practice, and have found that its best medicinal properties are its usefulness in phthisis pulmonalis and some scrofulous diseases, and in dysentery and mucous diarrhœa."

The oil is used by the natives as a remedy for excoriations, chaps, fissures of the lips, &c., by partly melting it and rubbing on the affected part. It is solid at ordinary temperature.

129. *G. Morella*, Desrouss. H.F.B.I., I. 264.

Syn.:—*G. pictoria*, Roxb., 444. *G. elliptica*, Wall.

Vern.:—The tree=Tamál, the drug=ghótághaubá, gotã ganbá, tamál (Hind.); the tree=Tamál, the drug=tamál (Beng.); the drug=Ausaraherevan (Dec., C. P.); the tree=Tamál, the drug=revâchini sirá, tamál (Mar.); the drug=Makki, iréval-chinip-pál, the oil=makki (Tam.); the drug=Réalchini-pál (Tel.); the tree=Arsinagurgi mara, aradal, punar puli; the drug=Tamál (Kan.); the tree=Darámba (Malay.)

This is the Gamboge tree, and yields abundant of that pigment. The gamboge of commerce, says Trimen, is obtained from Siam, and is the produce of a variety (Var. *pedicellata*, Hanb.) of this species, recently raised to the specific rank as *G. Hanburii* H. F. (Fig. 33. Med Plants. Bentley and Trimen).

Habitat:—Forests of Eastern Bengal, the Khasia Mountains, the Western Peninsula, in Malabar, Canara and Ceylon.

A small pyramidal tree, with spreading branches. Bark smooth brown, young twigs quadrangular. Wood hard, yellowish brown. Leaves 3-4½ in., broadly lanceolate or oval, acute at base, subacute, shining, paler beneath; lateral veins very oblique, inconspicuous; petioles ¼ in. Flowers greenish white, sessile, in axils of fallen leaves; Male 2 or 3 together, Female solitary; Sepals and petals 4 each, the latter longer; Male flowers:—Stamens monadelphous; filaments combined into a sub-quadrangular central column, but free at their summits; anthers dehiscing transversely. Female flowers:—Stamens about 12 in a ring round the ovary, connate at base; Ovary globular, smooth; 4-celled; stigma peltate, irregularly lobed and tubercled. Fruit small, ¾ in., globose, surrounded at base by persistent sepals, glabrous. Seeds 4, ovoid, kidney-shaped, slightly compressed, testa finely muriculate, blackish-brown.

Parts used:—The gum and branches.

Use:—The gamboge is officinal in the British and Indian Pharmacopœias. It is considered a valuable hydragogue cathartic. It also possesses anthelmintic properties. It is used in dropsical affections, amenorrhœa, obstinate constipation, and as a vermifuge.

The stem rubbed with water is a household remedy amongst natives, as a local application to rising pimples and boils, and often cuts them short. (Dr. GRAY in WATT's Dictionary.)

130. *G. xanthochymus*, Hook. f., H.F.B.I., I. 269.

Syn.:—*Xanthochymus pictorius* Roxb., 445.

Vern:—Dampel; tamál, (H.); Tamál, (B); Tepor, Tezpur,

Tilnor (Assam); Manho-la (Garó); Dampel, onth, osth. (Bomb); Jhárampi (Mar.); Jwara, memadi tamalumu, chitakamaraku, (Tel.)

Habitat:—Eastern Bengal and the Eastern Himalaya, from Sikkim to the Khasia Mountains, Eastern Peninsula, Western Peninsula, the Circars, and from the Bombay ghats southward. There is a tree in the Victoria Gardens, Bombay.

A medium-sized evergreen tree. Bark brown, $\frac{1}{4}$ in. thick, exfoliating in small round scales. Wood dark-greyish-brown, very hard, and close-grained; concentric bands thin, white, numerous. Pores very scanty, moderate sized, scattered and unevenly distributed. Medullary rays fine, white, numerous, but irregular. Yellow gum copious (Gamble). Foliage dense, dark green, shining. Branchlets quadrangular, dilated below the nodes. Leaves thickly coriaceous, oblong or elliptic-oblong, acute; blade 8-14 in. long, petiole $\frac{3}{4}$ -1 in. long, thick-channelled on the upper side, secondary nerves numerous, parallel with shorter intermediate nerves. Flowers white, fasciculate on thick uneven, axillary protuberances. Pedicels 1 in., petals $\frac{1}{2}$ in., orbicular spreading, thin. Male flowers: Stamens in 5 broad bundles of 3-5, on a fleshy lobed disk. Bisexual: Ovary 5-celled, stigma 5-lobed. Fruit dark yellow, 2-3 in. diam, of the size of an apple, 5-celled; subglobose, pointed. Seeds 1-4, oblong.

Use:—The fruit, which is yellow and of the size of a small apple and very acid, sweetish when ripe, edible, is used for the same purposes as that of *G. indica*; it is dried and made into a kind of Amsúl. In bilious conditions, a sherbet made with about 1 oz. of the Amsúl, with a little rock-salt, pepper, ginger, cumin and sugar, is administered (Dymock.)

131. *Ochrocarpus longifolius*, Benth. and Hook., H.F.B.I., I. 270.

Syn.:—*Calysaccion longifolium*, Wight.

Nágakêsaram-pushpam (Sans.)

Vern.:—Nág-késar-ké-phúl (the flowers), (Hind.); Nágésarer-phúl (the flowers), (Beng.); Surangi, támbra nágkesar (Bomb.);

Rân undi, sweet, i.e., *godî* undi, und (Koncan); Punnâg, suringi (Mar.); Râti-nâg-kesar (Guz.); Nâgap-pu, nagashâp-pu, nâgésar-pu, (the flowers), (Tam); Sura-poona (Tel); Wanai, laringi (male), pûne (female), suringi, gardundi (Kan.); Serâya (Malay.).

Habitat:—Forests of the Western Peninsula, from Canara to the Concan.

A large evergreen tree, young branches terete, youngest 4-gonous—"Bark reddish-brown, $\frac{1}{4}$ in. thick, exuding a red gum. Wood red, hard, close and even-grained. Pores moderately broad, very numerous, the distance between them equal to or less than, the diameter of the pores. Annual rings marked by a dark line. Lines of soft texture numerous, but indistinct. Numerous resin-ducts in radial long cells, which appear as shining lines on a horizontal, and black points on a vertical section" (Gamble). Leaves 5-9 by 2-2 $\frac{1}{2}$ in., thickly coriaceous, dark green, base rounded, mid-rib stout, prominent, veins few, indistinct, very slender, united by innumerable venules, which give the dried leaf a very beautifully lacunose appearance; petiole short, stout, $\frac{1}{4}$ in. Flower-buds globose, used to dye silk. Flowers highly fragrant, in dense fascicles. Male and bisexual, $\frac{3}{8}$ in. diam., on nodes clothed with subulate bracteoles in the axils of fallen leaves, or on the old wood. Pedicels 1 in. slender. Calyx bursting in 2 valves, reflected during the flowering. Petals 4, acute, thin, deciduous, white, tinged yellowish red, almost orange. Stamens many; Style subulate, Sitgma broad, discoid. Fruit obliquely ovoid, pointed, 1 in. long, tipped by the hard pointed style, stipitate, 1-seeded. "Flowers often hermaphrodite, and used for dying silk" (Beddome). Flowering time January, to March, in the Konkan forests.

Part used:—The flower-buds. *Fruit* edible, when ripe, sweet, refreshing.

Uses:—The flower-buds possess astringent and aromatic properties, and are sometimes prescribed medicinally (DYMCK.)

The flowers are stimulant and carminative. They are useful in some forms of dyspepsia and in hæmorrhoids. (MOODEEN SHERIFF.)

132. *Calophyllum inophyllum*, Lin., H.F.B.I.,
1. 273, Roxb. 437. Alexandrian Laurel.

Sans :—Punnága.

Vern. :—Sultána champa, Surpan, surpuka undi (H.); Súltan champâ, punnág (B.); Polong punang, (Uriya); Surangi, purreya, duggerfúl, undi (Sind.); undi (Bomb.); Udi (Outch.); Surfan, undi, surpanka (Dec.); Undi, undelar wundi, surangi, nágchámpá, pumag, undag (Mar.); Bintango, punna, Ponna (Mal.); Pinnay, pungam, punnaivirar, punnagam (Tam.); Púna, púnás, ponna pumágamu, ponna-chettu, ponna-vittulu (Tel.); Wúma pinne, ponna bija (Kan.)

Habitat :—Western Peninsula, Orissa and South India.

An evergreen, middle-sized, ornamental tree or shrub, glabrous. Buds only with minute rusty hairs. "Bark grey or blackish brown, smooth. Wood reddish brown, moderately hard, close-grained. Pores moderate sized, arranged in groups or oblique strings. Medullary rays extremely fine and numerous, bent round the pores. Occasional interrupted concentric lines of darker, but softer tissue, prominent on all sections" (Gamble). Leaves elliptic, elliptic-lanceolate, or obovate, coriaceous; blade 4-8 in., by 3-4 in., narrowed into petiole, $\frac{1}{2}$ -1 $\frac{1}{4}$ in. long, shining on both surfaces; veins many fine. Flowers scented, pure white, $\frac{3}{4}$ to 1 in. diam., in axillary racemes; Racemes in upper axils loose, 4-6 in. long, shorter than the leaves, lax, few-flowered. Pedicels slender, 1-2 in. Petals 4, like the inner sepals. Stamens numerous; filaments in 4 bundles. Rumphius and Blume say that the petals are sometimes 6-8. Ovary globose, stipitate; style much exceeding the Stamens. Stigma peltate, lobed. Fruit yellow, round, 1 in. diam., smooth, pulpy. The seeds yield oil used for lamps; often cultivated.

Parts used :—The oil of the seeds, and seeds.

Uses :—The kernels of this tree yield a grateful-smelling fixed oil, held by the natives in high esteem as an external application in rheumatism. From the bark exudes a resinous substance, Tacamahaca, said to resemble myrrh, and to be a useful remedy for indolent ulcers. (*Pharm. Indica.*)

The gum which flows from the wounded branches, mixed with strips of the bark and leaves, is steeped in water, and the oil which rises to the surface is used as an application to sore-eyes. Horsfield says that in Java the tree is supposed to possess diuretic properties (DRURY).

Rheede says that the tears which distil from the tree and its fruit are emetic and purgative.

The oil exercises a great beneficial influence over the mucous membrane of the genito-urinary organs, and is therefore highly useful in the treatment of gonorrhœa and gleet. Externally, it is a good and useful embrocation in rheumatism and gout. The watery paste of the kernel of the seeds, applied to the painful joints and dried by the heat of fire, often affords a great relief in the same diseases, and may be resorted to in the absence of the oil.

Although there is nothing in the sensible properties of this oil to indicate a poisonous character, yet, as far my knowledge extends, it has never been administered internally in this or any other country. Having satisfied myself by personal use that it is neither detrimental to life nor deleterious to health up to a certain quantity, I employed it in my practice and found it to be a very valuable drug. It acts as a specific on the mucous membrane of the genito-urinary organs, and its control, therefore, over gonorrhœa and gleet is very considerable. It is so certain and speedy in its action that its good effect in the above diseases is often noticed a few hours after the exhibition of its first dose (MOODEEN SHERIFF.)

The leaves soaked in water are employed as an application to inflamed eyes, in the Archipelago (Dr. Rice, New York). The fixed oil, expressed from the kernels of the seeds, is said to cure scabies (B. GUPTA, Pooree.)

According to the Hindoo writers, the bark is astringent and useful in internal hæmorrhages (U. C. DUTT.)

The juice of the bark is used as a purgative, and is said to be very powerful in its action. (SURGEON PEACOCK, Nasik.)

In rheumatism, the natives use the oil as an external application (E. A. MORRIS, Madras). Watt's Dictionary.

Oil from the seeds of Calophyllum inophyllum. The seeds contain 22.8–31.5 H₂O and 50.5–55 oil per cent. The oil has a yellowish-green colour, an odour resembling fenugreek, a bitter taste, and, on keeping, fatty glycerides are deposited. It solidifies at 3°, melts again at 8°, and has a sp. gr. 0.9428 at 15°, Reichert-Meissl number 0.13, saponification number 196.0, acid number 28.45, iodine number 92.8, refracto-meter number 76 at 40°; it contains 0.25 per cent. of unsaponifiable matter. The increase in weight due to oxygen absorption, when measured by Livache's method, amounted to 0.25, 0.71, 1.52, and 1.81 per cent. after 18, 40, 64, and 136 hours. Treatment with 5 per cent. soda solution removes the resinous constituents. The purified oil solidifies at 4°, melts again at 8°, and has Reichert-Meissl number 0.18, saponification number 191, iodine number 86. The fatty acids of the oil are chiefly palmitic, stearic, and oleic. J. Ch. S. Vol. 88 pt. 2, page 277.

The seeds are brownish black, almost spherical, $\frac{1}{4}$ –1 inch in diameter and consist of an easily-broken shell surrounding a round, soft, whitish kernel which weighs about 4 grms. The kernels contain 13 per cent. of moisture and 55 per cent. of viscous, green, bitter oil.

Some samples of kernels from Bengal contained 3.3 per cent. of moisture and 71.4 per cent. of oil having the sp. gr. at 15° C. 0.950; acid value 45.9; Saponification value, 193.203; iodine value, 97.7.

The oil is excellent for soap making. The residual cake is bitter and therefore suitable for use as a manure.

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133. *C. Wightianum*, Wall., H.F.B.I., I. 274.

Syn. :—*C. decipiens*, Wight; *C. Spurium*, Choisy.

Vern. :—Kalpun, kutt-ponne bobbi, (Kan.); Cheru pinnay, pútengi (Tam.); Tsirou-panna (Mal.); Cherupiani, sarapuna (Bomb.); Irai (Mar.)

Habitat :—Western ghats, from the Konkan to Travancore.

A middle-sized evergreen tree, almost entirely glabrous. Bark yellow, very characteristic. Wood hard, red. Pores large and moderate-sized, uniformly distributed. Medullary rays very fine, not very distinct. Numerous, interrupted wavy and anastomosing connective bands of soft tissue (Gamble). Young shoots 4-gonal, often pruinose. Leaves rigidly coriaceous, obovate, obtuse or oblong-cuneate; 2.4 by 1 $\frac{1}{4}$ –2 in.; veins most prominent on the undersurface; petiole $\frac{1}{2}$ in. Racemes from the axils of all the leaves and scars of fallen ones, several-flowered, shorter than the leaves. Peduncles and pedicels slender. The Racemes are shorter than the leaves. Flowers $\frac{1}{4}$ – $\frac{1}{2}$ in. diam. Sepals 4, very thin, strongly-veined. Petals 0 (or 4 small ones

visible in the bud, Wight). Fruit 1 by $\frac{3}{4}$ in. ellipsoid. Anderson says that he never found petals in any of the buds he opened.

Medicinal use :—Bouton, in his Medical Plants of Mauritius, says that the resin obtained from this plant acts as a "vulnerary resolutive and anodyne." The oil obtained from the seeds is used as medicine in leprosy and cutaneous affections, and in infusion, mixed with honey, in scabies and rheumatism (WATT ii. 33.)

134. *Mesua ferrea*, Linn. H.F.B.I., i. 277
Roxb. 437.

Syn. :—*M. speciosa*, Chois; *M. coromandeliana*, Wight.

Sans. :—Nágakesara.

Vern. :—Nágkesar; naghas (H. and B.); Nageshvaro, nágésvar (Uriya); Nahor (Assam.); Nagchampa; thorlachampa (Bom.); Nágchampa, thorlâ chumpa (Bombay); Nágachampa; nágchámpha (Mar.); Naugal; Mallay naugal; nágap-pu; Nagas-háp-pu (Tam.); Naug (Tinnevelley); Nága Kesara; nága kesaramu; gejpashpam (Tel.); Naga sampigi; Nassampige (Kan.); Behetta-cham-pagam; velutta-chenpakam (Mal.).

Habitat :—Mountains of Eastern Bengal, the Eastern Himalaya and the Eastern and Western Peninsulas.

A large evergreen glabrous tree; trunk erect, straight; twigs slender sub-4-angled. "Bark $\frac{1}{4}$ in. thick, reddish-brown, peeling off in flat thin cakes, having a slightly roughened surface. Wood somewhat resembling that of *Calophyllum*, but much harder and heavier. Heart-wood red, dark, extremely hard. Pores moderate-sized, scanty, often filled with yellow resin, singly or grouped, or in oblique strings of varying length. Medullary rays extremely fine, uniform, equidistant, very numerous. Numerous fine wavy lines of dark-coloured tissue, regular and prominent, but of very different lengths (Gamble). The young shoots at first brilliant red, then pink, gradually passing into dark green (Brandis). Leaves coriaceous, 2-6 by $1\frac{1}{2}$ to $1\frac{3}{4}$ in., drooping linear-lanceolate, base acute or rounded, dark green and shining above, covered more or less with a fine waxy meal beneath; veins very fine, close-set and equally

inconspicuous on both surfaces; petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. Flowers very fragrant, usually terminal and solitary or in pair, nearly sessile bisexual, 3-4 in. diam. Flowers, Feb-April. Sepals 4, in 2 rows, thick orbicular, with membranous margins, inner pair largest. Petals 4, imbricate, spreading cuneate obovate, pure white. Stamens indefinite, Anthers as large, oblong, linear, basifixed, golden yellow. Ovary 2-celled, 2 ovules in each cell; style filiform; stigma peltate. Fruit pointed, conically ovoid, 1-1 $\frac{1}{4}$ in., 2-valved. Valves tough, supported by the enlarged sepals. Seeds 1-4, testa smooth, hard, shining, dark brown; embryo a fleshy homogeneous mass.

Parts used.—The flowers, kernel, bark and leaves.

Use.—The flowers are considered by the Hindu physicians to have astringent and stomachic properties. A paste made of the flowers with butter and sugar, is used in bleeding piles and burning of the feet. (U. C. DUTT.)

The flowers and leaves are used in Bengal as antidote to snake poison (O'Shaughnessy). The bark is mildly astringent and feebly aromatic (Dymock); the oil of the seeds is used as an embrocation in rheumatism in North Canara (Ph. Ind., p. 32), and found useful in the treatment of itch by K. L. Dey.

In many localities, the flowers are used for cough, especially when attended with much expectoration. Rheede states that the bark is given as a sudorific combined with ginger.

Moodeen Sheriff considers the flowers of *Mesua ferrea* and *Ochrocarpus longifolius* to be stimulant and carminative and useful in some forms of dyspepsia and in hæmorrhoids.

The seeds resemble chestnuts in colour and form. The kernel yields 79.48 p.c. of a brown non-drying oil, partially soluble in alcohol, and gives an orange coloration, with a mixture of sulphuric and nitric acids. The residue contains 24.14 p. c. of proteins. (J. Ch. I, for Aug. 31, 1910, p. 1019.)

The seeds are brown and generally pear-shaped; they consist of a shiny, brittle, woody shell containing a single buff-colored kernel. Shell 34 per cent., kernel 56 per cent. The kernels contain 76 per cent. of reddish brown oil with a sweetish smell and slight bitter taste. The oil became semi-solid on standing at 15° C. Sp-gr. at 15° C. 0.935; saponification value, 204; iodine value, 90. The oil is useful in soap making. The residual cake is bitter and probably poisonous; it would only be of value as manure.

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N. O. TERNSTROEMIACEÆ.

135. *Schima Wallichii*, Choisy, H.F.B.I., I. 289.

Syn.—*Gordonia integrifolia*, Roxb. 426.

Vern. :—Makusal, Chilauni, makriyá Chilauni (H.); Dingan (Khasia); Boldak (Garó.), Jam (Cachar); Sumbrong (Lepcha); Gugera (Goalpara).

Habitat :—Eastern Himalaya, from Sikkim to Bhotan. Assam, Chittagong and the Khasia Mountains.

A large evergreen, with papery leaves, 80-100ft. Bark, black or dark grey, with deep vertical cracks. Wood rough, red, moderately hard, shrinks much in seasoning, but is durable. Buds, branchlets, petioles and upperside of leaves pubescent, sometimes tomentose. Leaves 6-7 by 2-3in., elliptic, tapering or rounded below, acute or slightly acuminate, glabrous and reddish-veined above, reticulate, and more or less pubescent beneath, entire or obscurely crenate-serrate, with forked lateral veins., petiole $\frac{1}{2}$ in., pubescent. Peduncles rather slender, $\frac{3}{4}$ -2in., with minute white warts. Bracts $\frac{1}{2}$ in., alternate, narrow, oblong, retuse. Flowers $1\frac{1}{2}$ -2in. diam., white, fragrant. Sepals $\frac{1}{2}$ in. long, with pubescent-ciliate margins, glabrous, or slightly pubescent outside; petals pubescent outside at the base. Stamens yellow. Fruit $\frac{3}{4}$ in. diam., pubescent when young, afterwards minutely warted.

Use :—"The bark is nearly black externally, with deep clefts; the liber is made up of an abundance of white, needle-shaped cells, which are readily detached and act as cowage, in producing painful irritation, when brought into contact with the skin."—Gamble.

N. O. DIPTEROCARPEÆ.

136. *Dipterocarpus turbinatus*, Gaertn f.
H.F.B.I., I. 295. Roxb. 439.

Vern.—Gurjun, tiliya gurjun (Beng.); challan (Kan).
The Balsam, garjan-kā-tel (H. and Bom.).

A lofty evergreen tree. Young branches compressed. Wood rough, soft to moderately hard; sap wood white, heartwood red-brown, but not durable. Leaves ovate or ovate-lanceolate, entire or sinuate-crenate, acute, base rounded; 5-12 by 2½-7 in; glabrous on both surfaces or slightly pubescent, especially on the nerves and margins; lateral nerves 14-18 pair. Petiole 1½-3 in.; stipules with dense stellate canescence, pubescent towards the apex, varies greatly in regard to the pubescence of young shoots, leaves and inflorescence. Racemes 3-5-flowered. Flowers 3 in. diam; Calyx-tube obconic, hairy, subspheroidal, mouth contracted, unenlarged lobes deltoid-ovate. Petals pinkish white. Nut pubescent.

Habitat.—Eastern Bengal and Eastern Peninsula, from Chittagong and Pegu to Singapur; not in Ceylon, nor in the Konkan.

Use:—The oleo-resin is applied externally to ulcers, ring-worm, and other cutaneous affections (Watt.) It is stimulant of mucous surfaces, particularly that of the genito-urinary system; and also diuretic. In gonorrhœa and other affections in which copaiba is generally employed, it has proved an effectual remedy (Ph. Ind., p. 32). Quite recently it has been brought prominently to notice by Dr. Dougall, of the Andamans, as a remedy for leprosy; but, as far as I have heard, the new remedy is not likely to prove successful (Dymock).

The best medical properties of this oil are its usefulness in gonorrhœa and gleet, and in all forms of psoriasis, including lepra vulgaris. In gonorrhœa and gleet, it is at least equal to Copaiba, and the only difference between these two drugs is that the former (Gurjun balsam) requires to be used in a much larger dose (3ii to 3iii) to produce the same effect as the latter. As Gurjun balsam is always used in the form of emulsion with mucilage, the largeness of its dose is no disadvantage. With regard to its usefulness in psoriasis and lepra vulgaris, I am not aware of any other local stimulant which is more efficacious in those diseases than this drug. I have either cured or relieved many cases of the above affections by the use of this drug, with little or no assistance of internal

remedies. The internal use Gurjun oil is also attended with benefit in some cases of true leprosy, in its early stage; but its efficacy in this respect is greatly enhanced with the addition of from five to ten drops of *Chaulmugra* oil to each drachm of it. If well mixed in the above proportion, the combination of *Chaulmugra* oil cannot be detected. Some years ago, I had received a bottle of Gurjun oil of this kind from a medical friend, which proved more useful in a case of true leprosy than all its varieties in the bazaar, but I did not know the existence of *Chaulmugra* oil in it, until I was informed of it. (Moodeen Sheriff.)

Balsamum Dipterocarpi (gurjun—or gardjan balsam, garjantel, wood-oil) is a product of various species of the genus *Dipterocarpus*, indigenous in South Asia. About 80–82 per cent. of it consists of an essential oil, which can be removed by distillation with steam; this boils at 255° and has sp. gr. 0.912 at 15°. Of the residue, *gurjoresen*, $C_{17}H_{23}O_2$, forms the chief part, amounting to 16–18 per cent. of the balsam; it is amorphous and melts at 40–43°. Only about 3 per cent. of the balsam consists of resin acids; the bulk of these dissolves in 1 per cent. ammonium carbonate solution and is amorphous; the rest is insoluble, but dissolves in 1 per cent. sodium carbonate solution; this part was obtained to some extent in a crystalline state.

The deposits, largely crystalline in character, which had formed in various samples of gurjun balsam, were submitted to examination. They consist of crystalline resin-alcohols or resin-phenols, but yet are insoluble in alkalis, in these respects resembling amyris, $C_{30}H_{50}O$. A substance obtained from Hirschsohn, and designated by him "neutral substance from gurjun balsam," consisted of such a hydroxy-compound, *gurjuresinol*, $C_{15}H_{25}OH$, probably identical with metacholestol (Mach, Abstr., 1895, i, 384) and copaivic acid (Keto, Abstr., 1902, i, 167); it melts at 131–132° and forms acetyl and benzoyl derivatives melting at 96° and 106–107° respectively. The crystalline *gurjuturbioresinol*, from *Dipterocarpus turbinatus*, has the composition $C_{20}H_{30}O_2$, and melts at 126–129°; it is probably identical with Merck's copaivic acid and Trommsdorff's metacopaivic acid (Brix, Abstr., 1882, 65). Hirschsohn's "sodium salt from gurjun balsam," when purified by recrystallisation, contained 3.6 per cent. of sodium; it consists of *gurjuresinol* along with the sodium salt of *gurjuresinolic acid*, $C_{15}H_{25}O_4$; the acid is crystalline and melts at 254–255°. J. Ch. S. Vol. 84, part 1, p. 771.

137. *D. tuberculatus*, Roxb. H.F.B.I., I. 297; Roxb. 410.

Habitat:—Chittagong and Burma.

A large deciduous gregarious tree. "Bark dark grey. Wood dark red-brown, hard. Pores circular, large and moderate-sized,

often filled with resin, rather unevenly distributed. Medullary rays prominent, moderately broad, with a number of fine rays between each pair of broad ones; the distance between the broader rays equal to or up to twice the transverse diameter of the pores, the small rays passing through or round the pores". (Gamble). Young branches compressed, glabrous or canescent. Stipules 4-5 in. long, greenish, tomentose. Leaves 10-18 by 5-14 in., cordiform, acute, base cordate or truncate, margins sinuate-crenate, undulate; lateral nerves, 15 pair; petiole 4-5 in. Racemes 5-6 in., simple or 2-fid, 4-7-flowered. Flowers large, rose-coloured; petals $1\frac{1}{4}$ in. long, tomentose outside. Fruiting calyx-tube obovate, velvety when young, glabrous when mature, between the segments produced into 5 sharp knobs. Calyx-tube in fruit $1\frac{1}{4}$ by 1 in., mouth contracted, wings 4-5 by $1\frac{1}{4}$ - $1\frac{1}{2}$ in., linear-elliptic, obtuse, 3-nerved. Nuts tomentose.

Use:—According to Mason, the oleo-resin of this tree is used with assafoetida and cocoanut oil as an application for large ulcers.

138. *D. alatus*, Roxb. H.F.B.I., I. 298, Roxb. 439.

Vern:—Garjan (B.);

Habitat:—Chittagong. Andamans, Pegu, Tenasserim, Siam, Combodia.

A very large tree with a grey bark. Sapwood white; heartwood reddish-grey, moderately hard, smooth, mottled (Gamble). Shoots and stipules pubescent. Leaves ovate or elliptic, acute, pubescent beneath, margin ciliate; secondary nerves 12-15 pair, blade 4-6 in. Petiole softly hairy, $1-1\frac{1}{2}$ in. long. Wings on fruiting calyx-tube, broad, half the diameter of the tube or more. Raceme about 7-flowered.

The medullary rays consist of two classes of cells, long and short. The former up to 0.12 in. long, are filled with wood oil.

Use:—This species yields, like *D. turbinatus*, most of the Gurjun Balsam of commerce.

139. *D. incanus*, Roxb. H.F.B.I., I. 298. Roxb. 439.

Habitat:—"Pegu, South Andamans (common), Chittagong (doubtful), Tongkah in Siam on the East Coast of the Malay Peninsula, at its north extremity," says Brandis. Roxburgh says thus:—"Gurjin is the vernacular name at Chittagong where the tree grows to a great size, and is said to furnish the largest proportion of the best sort of wood oil or balsam."

All tender parts softly hairy, pubescent, compressed, branchlets, young shoots and petioles. Leaves ovate, with the base somewhat tapering, obtuse, soft and villous, 6 by 4½ in., thinly pubescent on both surfaces, margins ciliate, lateral nerves strongly marked, 12 pair, pubescent beneath. Petiole 2 in., softly pubescent. Calyx-tube (in flower) softly pubescent, strongly winged. (W. T. Thiselton Dyer). "Spikes, axillary, half the length of the leaves; belly of the Calyx simply fine-winged," Roxb. (*Op cit*). Flowers in Nov.-Dec. Seed ripens in April. Stamens indefinite.

Use:—The species also yields most of the Gurjun Balsam of Commerce.

140. *Shorea robusta*, Gaertn., H.F.B.I., 1. 306.
Roxb. 440.

Sans.:—Sāla. Asvakarna.

Vern.:—Sal, sala, salwa, sakhu, sakher, sakoh (resin)=rall dhuna, damar (Hind.); Sal, shal (resin)=rall dhuna (Beng.); Sarjmu, serkura. (Kol); Sarjom, Sontal; Sorgi Bhumij, sekwa, sekwa oraon, bolsal (Garo); Sakwa (Nepal) Tatural, (Lepcha); Salwa, saringhui (Uriya); Sal, sarei, rinjal (C. P.); Sal, kandar sakhu, koron (N.-W. P.); Koroh (Oudh); Sal, seral (resin)=ral, dhua (Bomb.); (resin)=rala, guggul (Mar.); (resin)=ral, (Guz.); (resin)=guggala (Khan.);

Habitat:—Tropical Himalaya, and along its base, from Assam to the Sutlej, Eastern districts of Central India, Western Bengal Hills.

A large gregarious tree, deciduous, but never quite leafless. Bark off young tree smooth, with a few long, deep, vertical cracks; of old trees 1-2 in. thick, dark-coloured, rough, with deep

longitudinal furrows. Wood. Sapwood small, whitish, not durable; heartwood brown, pale, when first cut but darkening on exposure, coarse-grained, hard, with a remarkably cross-grained and fibrous structure; the fibres of alternate belts in the wood on a vertical section, running in opposite directions, so that when the wood is dressed, a very sharp plane is necessary, or it will not get smooth; does not season well. Leaves, when full grown, glabrous and shining, 6-10 by 4-6 in., petiole $\frac{3}{4}$ -1 in., stipules $\frac{1}{2}$ in., falcate, pubescent, caducous.—(W. T. Thiselton Dyer). 4-12 by 2-7 in., ovate-oblong, acuminate, tough, thinly coriaceous; lateral nerves 12-15 pair, twice near the apex, very slender, base cordate or rounded; petioles terete (Kanjilal). Flowers in large lax terminal or axillary racemose panicles covered with white pubescence. Calyx-tube short, adnate to the torus; segments ovate, all accrescent in fruit. Petals pale yellow, about $\frac{1}{2}$ in. long, narrow, oblong, lanceolate, bearded, minutely trifid at apex. Ovary 3-celled; style subulate. Fruit $\frac{1}{2}$ in. long, ovoid, acute, rather fleshy, indehiscent, white—pubescent. Wings 5, 2-3 in. long, spathulate, narrowed at the base, brown when dry, somewhat unequal, with 10-12 straight parallel nerves.

The tree yields, when tapped, a large quantity of white opaline resin, which is burnt as incense. An oil is extracted from the fruit which is used for burning and to adulterate with ghee. The fruit is formed into flour and eaten by the poorer classes in times of scarcity (Kanjilal).

This is the principal tree of the Siwalik Division. In Nepal, it attains 100-150 ft., with a clear stem, to the first branch of 60-80 ft., and a girth of 20-25 ft. (Brandis). Within the limits of the Siwalik and Jaunsar Flora, it is seldom more than 80 ft. in height, and 6 ft. in girth, unless hollow inside (Kanjilal). "Tropical Himalaya and along its base, from Assam to the Sutlej. Eastern Districts, Central India, western Bengal Hills." (W. T. T. Dyer).

Parts used :—The resin and leaves.

Use :—By the Hindoo writers, the resin is regarded as astringent and detergent, and is used in dysentery, and for fumigations, plasters, &c. The resin thrown over the fire gives

out thick volumes of fragrant smoke, and is much used for fumigating rooms occupied by the sick (U. C. Dutt).

The superior kinds of Sál resin are efficient substitutes for the Pine resins of the European Pharmacopœias. (Beng. Disp., p. 221.)

Dr. Sakharam Arjun states ('Bombay Drugs') that he has seen shorea resin, mixed with sugar, given with good effect in dysentery.

According to Mr. Campbell, the leaves are used medicinally by the Santals.

The resin is used by native doctors for weak digestion, gonorrhœa, and as an aphrodisiac (WATT.)

It is not prescribed internally, but used occasionally for fumigation of rooms and houses, to remove bad odours. It does not destroy offensive smell, but rather conceals it under its thick and odoriferous smoke. There is every reason to think that it will prove itself an efficient ingredient in many ointments and plasters, if employed, instead of pine and other resins (MOODEEN SHERIFF.).

141. *S. Tumbuggaia*, Roxb. H.F.B.I., I. 306. Roxb. 440.

Vern.:—Kâlâ-dâmar, (H. ; B. ; and Mar. and the Dec.) ; Kâlo-dâmar, (Guz.) ; Karapu-dâmar ; Tumbugai-pishin (Tam.) ; nalba-damar ; Nalla-sojan (Tel.) ; Kara-kundurukam, Tumbugaipasha (Mal.)

Habitat:—Western Peninsula, forests of Cudapah, and Palaghat in Mysore.

A "gigantic dammer-producing" tree. Bark dry, rough, with deep vertical fissures, like those of *Shorea robusta*. Wood smooth, harder than that of Sal, but similar in structure and much smoother. Leaves $2\frac{1}{2}$ -3 by $1\frac{1}{2}$ - $4\frac{1}{2}$ in. (Beddome), ovate or oblong-cordiform, acuminate ; base truncate or emarginate, glabrous on both surfaces, lateral nerves about 8 pair. Petiole 1-2 in. Panicles terminal, 8 in. long, hoary or nearly glabrous. Flowers shortly pedicelled, buds densely hoary. Stamens about

30. Anthers with a hairy appendage. Stigma 3-lobulate. Capsule $\frac{3}{4}$ in. long, ovoid, acuminate, pubescent above; bases of fruiting Calyx-segments $\frac{1}{2}$ in. long., ovate, hoary; wings $1\frac{1}{2}$ - $1\frac{3}{4}$ by $\frac{1}{2}$ in., spatulate, obtuse, 8-10-nerved.

Part used :—The resin.

Use :—It is an external stimulant. Not used internally.

To all appearance, it will form a good basis for some plasters and ointments (MOODEEN SHERIFF).

142. *Vateria Indica*, Linn., H.F.B.I., I. 313.
Roxb. 436.

Vern. :—Sufed-dámar; kahruba, sandras (H.); Koondrikum, vellikoondricum (Tam.); Vellakoondricum, Peinimarum (Malay); Dupa maram (Kan.); Dupadu, (Tel.); Chandrus (B.); Ral (Bomb.).

Eng. :—Indian Copal, Piney varnish, or white Dammar Tree.

Habitat :—Western Peninsula, from Canara to Travancore.

A large handsome evergreen tree; young shoots and inflorescence clothed with a scurfy stellate tomentum (Brandis). Bark whitish grey, rough, $\frac{3}{8}$ in. thick, peeling off in round thick flakes. Sapwood white, with a tinge of grey or red; heartwood light grey, rough, moderately hard, porous. Pores large, often subdivided, ringed. Medullary rays fine and broad, very prominent on all vertical sections, while on radial section they appear as rough plates, with shining fibres between them. The distance between the broad rays is generally greater than the transverse diameter of the pores. Annual rings doubtful, though distinct (Gamble). Leaves coriaceous, glabrous, elliptic-oblong; blade 4-10 by $2\frac{1}{2}$ - $3\frac{1}{2}$ in., obtuse or minutely acuminate, base rounded or emarginate; petiole 1- $1\frac{1}{2}$ in. long, secondary nerves 14-16 pair, prominent beneath as well as midrib. Stipules $\frac{1}{2}$ in., obliquely lanceolate, acute. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. across, one-ranked, erect, in large terminal panicles, loosely corymbose; pedicels longer than Calyx-segments, which latter are lanceolate, obtuse, canescent on both surfaces. Petals spreading, slightly

pubescent outside. Stamens 30-40; filaments short; anthers linear, hairy at base, glabrous above, cells unequal, the outer longer; appendix of connective as long as the anther. Ovary tomentose, style filiform, stigma minute. Fruit ovoid, 2-2½ in. long, splitting open into valves, fruiting-Calyx small, segments reflexed. Cotyledons filled with fat (Piney tallow)—Brandis. Piney gum—resin, says Gamble, (P. 85, Indian Timbers), makes an excellent varnish. One of the handsomest trees in Madras and Travancore.

Parts used :—The oil, and resin.

Use :—Under the influence of gentle heat, it combines with wax and oil and forms an excellent resinous ointment; it forms a good substitute for officinal resin (G. Bidie.) From the fruit is obtained a solid fatty oil, which has obtained considerable repute as local application in chronic rheumatism and some other painful affections. It might be employed as a basis for ointments, &c. (Ph. Ind., p. 33.) Fine shavings of the resin are said by Irvine to be administered internally to check diarrhœa (Watt).

N. O. MALVACEÆ.

143. *Althœa officinalis*, Linn., H.F.B.I., I. 319.

This is the English Marsh-mallow, which yields "Guimauve," the sweet soft lozenges of which are used for sore-throat.

Vern. :—The flowers, Gul-Khairu (Hind. and Bomb.); She-maituti (Tam.)

The fruits, Tukm-i-khitme (Pers. and Bomb.)

The roots, Resha-i-khitme (Pers. and Bomb.)

Habitat :—Kashmir.

A perennial, uniformly downy herb. Stem erect, 2-3 ft. Leaves ovate or ovoid, simple or slightly lobed, annular, base scarcely cordate, unequally toothed. Stipules linear-subulate. Flowers peduncled, in axillary clusters, 1-2 in. diam., rosy. Bracteoles linear-lanceolate, half the length of the sepals. Anthers subglobose. Ovary many-celled; ovules one in each

cell. Carpels numerous, ultimately separating from a short torus. Seed solitary in each carpel, ascending.

Parts used :—The flowers, carpels, leaves and root.

Uses :—The Mahomedans describe it as a suppurative and emollient; they use the leaves as a poultice and for fomentations; mixed with oil, the leaves and flowers are applied to burns and parts bitten by venomous reptiles. The root boiled with sugar is prescribed in coughs and irritable condition of the intestines and bladder. The decoction is also used as an emollient enema, and in making ointments (DYMCK.)

The root should be gathered in the autumn from plants not less than two years old.

Emollient cataplasms are prepared from the rounded root.

The root contains a little starch, nearly twenty per cent of gum or mucilage, some uncrystallizable sugar, and a crystallizable principle, besides other unimportant constituents. The mucilage lies like the fecula in small cells, in the form of minute grains, which may be obtained pure by washing the chopped root in rectified spirit, and allowing them to subside. A yellowish white powder is thus procured, consisting of microscopic transparent grains, which seem intermediate between true gum and perfect starch. The crystalline principle "althæin" seems to be identical with the "asparagin" of asparagus. (Sowerby's English Botany.)

Betaine can be obtained from the aqueous extract of the root of *Althæa officinalis* after removing the asparagine by precipitating it with nitric acid and sodium phosphomolybdate; the free base obtained by treating the precipitate with barium hydroxide forms colourless crystals, is soluble in water and alcohol, and insoluble in ether. The hydrochloride is easily crystallised, and does not change on exposure to the air. With potassium dichromate solution and hydrochloric acid, betaine does not exhibit any colour reaction. It is precipitated by pieric acid, zinc chloride, and auric chloride, but not by tannin; the aurochloride, $C_5H_{11}NO_2 \cdot HAuCl_4$, crystallises in microscopic plates, or in short crystals arranged in the form of a cross.

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144. *A. rosea*, Linn. H.F.B.I., I. 319.

Vern. :—The same as for *A. officinalis*, Linn.

Eng. :—Holly-hock.

This is a cultivated, herbaceous plant in Indian gardens from English seed.

Root biennial. Stem in garden-growth in pots, 6-10 ft. high, erect, stout, simple, more or less hispid, with fasciculated branched hairs

Leaves on rather short petioles, cordate, five-to seven-lobed, the lobes angled, unequally serrated; upperside dark green, slightly downy, beneath pale, more downy, with fasciculated stipules, large, unequally bifid. Flowers solitary, large, handsome. Petiole short. Calyx large, five-cleft, downy, striated, the segments acute. Involucre monophyllous, large, cup-shaped, six-to-nine-lobed, striated, downy, the lobes obtuse, often bifid. Staminal tube short. Anthers very numerous, pale yellow. Ovaries numerous, collected around the dilated downy base of the style which latter is cleft at the extremity into several segments. Corolla of five very broad, wavy, obcordate or somewhat cuneate petals, united at the base, often with a pale eye or centre, surrounded with a deep, black-purple, ring.

Parts used :—The flowers, leaves, seeds and root.

Uses :—The seeds of this plant are demulcent, diuretic and febrifuge. The flowers have cooling and diuretic properties. The roots are supposed to be astringent and demulcent, and are much used in France to form demulcent drinks.

In the Punjab, the flowers are given in rheumatism, and the roots in dysentery (STEWART.)

The leaves and roots are also used for the same purposes as of the preceding species.

Moodeen Sheriff describes the properties, and used *A. officinalis* and *A. rosea* collectively. According to him, they are demulcent, refrigerant and emollient. The mucilage of the petioles, stem and roots is generally a very useful adjunct to other medicines in dysentery and mucous diarrhœa, and, in some very slight cases, it is sufficient by itself to relieve these diseases to a great extent. Tormina and tenesmus are the symptoms which are most relieved by it. The decoction of the

dry root and seeds is useful in irritable and inflamed states of the pulmonary and genito-urinary mucous membranes.

145. *Malva sylvestris*, Linn., H.F.B.I., I. 320.

Vern.:—Khubazi (Bomb.); Kunji, tilchuni, vilayati-kangai-kà-per goolkheir, (H.); Viláyati-kangoi-kà-jhar (Dec.); Khabājhi, (Sind.)

Habitat :—Western temperate Himalaya, from Kumaon to Kashmir and the Punjab.

An erect, nearly glabrous annual herb, 1-3ft. high. Leaves cordate, rounded, lobed; petioles 4-5 in. Peduncles about 1 in. Bracteoles ovate, entire, shorter than the bell-shaped Calyx. Corolla $1\frac{1}{2}$ in. diam. Petals notched, claw bearded. Carpels reticulated, downy or glabrous.

Parts used :—All parts of the plant.

Uses :—All parts of the plant are commended in Mahomedan works, on account of their mucilaginous and cooling properties, but the fruit is considered to be most efficient (DYMCK). *

It is prescribed in pulmonary affections (WATT). Useful in irritation of the skin and for fomentations. The leaves are used as emollient cataplasms. As *Gulkand* used in strangury, (MURRAY, p. 58.)

The little hard fruit, tasting something like a nut, is commonly called a "cheese." "Chucky cheese" is the name given in Devonshire to the plant, in allusion to these little cheese-like fruits.

There is a tradition that Mahomed had a garment made of the Mallow fibre; and he was so well pleased with it, that he turned the plant into the more showy, but less useful geranium (Sowerby's English Botany).

146. *M. rotundifolia*, Linn., H.F.B.I., I. 320.

Vern.:—Sonchala (Pb. and H.); Khubazi (H.); Chanderee (Sind.); Trikála malle (Tel.); Kùkerai (Pushto.)

Habitat :—North-West Provinces, Kumaon, Sindh and the Deccan.

A spreading herb, much branched, sparingly villous. Leaves suborbicular, lobed, crenate; petiole 6-7 in. Peduncles $1\frac{1}{2}$ in., deflexed after flowering. Bracteoles lanceolate, half the length of the broadly lance-shaped sepals. Corolla 1 in. diam. Petals wedge-shaped, notched, twice the length of the sepals; claw of petal bearded. Ripe carpels downy, flat or wrinkled.

Parts used :—The leaves and seed.

Use :—The leaves are mucilaginous and emollient, employed externally in scurvy, and reckoned useful in piles (HONNIGBERGER.)

The seeds possess demulcent properties; they are prescribed in bronchitis, cough, inflammation of the bladder, and hæmorrhoids; the seeds are also externally applied in skin diseases (WATT).

147. *M. parviflora*, Linn., H.F.B.I., I. 321.

Vern. :—Narr, panirak, supra, sonchol, gogi sàg (H. & Pb.)

Habitat :—North-West Himalaya, Upper Bengal, Sindh, and the Punjab.

A comparatively small, spreading herb, slightly downy. Leaves roundish, obsoletely lobed. Peduncles short, spreading after flowering. Bracts linear. Sepals broad, acute. Petals notched, scarcely exceeding the sepals. Claw of petals glabrous. Carpels wrinkled.

Parts used :—The seeds and root.

Use :—The seeds are used as a demulcent in coughs, and ulcers in the bladder (WATT).

148. *Sida humilis*, Willd., H.F.B.I., I. 322. Roxb. 516.

* *Sida veronicifolia*, Lamk, is, according to Schuma, the oldest name for *S. humilis* (Trimen).

Sanskrit :—Bhumibala;

Vern.:—Junka (B.); Bir; tandi; bariar; Jokha; sakam (Santal.); Palampàsi (Tam.); Gàyapu àku (TEL.); (Gujrat and Porebunder) Bhoyabala; (Marathi) Bhui chiknà, Bhoybal; (Hindi) Bananiyâr; (Sinhalese) Bevila; (Tam.) Palum-padu.

Habitat:—Generally distributed throughout the hotter parts of India, Ceylon and grassy ground and waste places.

A perennial herb; branches long, prostrate, trailing, rooting at the nodes, with scattered stellate hairs. Leaves variable in size, $\frac{1}{2}$ -1 in., broadly ovate, cordate at base, acute, coarsely crenate-serrate, sparsely covered with long hairs. Petiole $\frac{1}{4}$ - $\frac{1}{3}$ in., hairy. Flowers pale yellow, rather small, numerous, less than half an inch in diam. Peduncle 1 in. or more, stiff, slender, slightly hairy. Calyx 5-angled, segments triangular, very acute, with stellate hairs on margin. Petals broader than long, truncate, ripe carpels 5-pointed, slightly bicuspidate, smooth (Trimen).

Part used:—The leaves.

Use:—Among the Santals, the leaves are pounded, and used as a local application to cuts and bruises. They are also given in the diarrhœa of pregnancy (Rev. CAMPBELL).

Jayakrishna Indrajî says that the flowers and unripe fruits are given together in sugar for burning sensation, in micturition.

149. *S. spinosa*, Linn., H.F.B.I., I. 123.

Syn.:—*S. alba*, L., *S. alinifolia*, L., Roxb. 516.

Sans.:—Nâgabalâ. Khar-yashtikâ—J. Indrajî.

Vern.:—Jangli-méthi, gulsakari (Hind. and Deck.); Kântalo-bal; (Guj. and Porebunder). (Marâthi) Kânteri Tukati; Khareti, Gulsakari; (Hindi). Mayirmânikkam (Tam.); Mayilumânikyam (Te.); Mayirmanikkam, Katta-ventiyam (Malay.); Kâdu-menthya (Can.); Pilabaréla, Bôn-méthi (Beng.); Koti-kâmbabila, Mairmânîkam (Sinh.); Shanbalide-barri, Shamlithe-dashti (Pers.); Kulbahebarri (Arab.).

Habitat:—Throughout the hotter parts of India and Ceylon.

An erect, much-branched undershrub; stems slender, rough, with minute stellate hairs, often with small, recurved prickles at the nodes below the petioles. Leaves 1-1½ in., oval or oblong, obtuse, coarsely crenate-serrate, glabrous above, finely stellate-pubescent beneath. Petiole ½-⅝ in., stellate-pubescent. Flowers white, ½ in., pedicels ½-¾ in., slender, jointed near top. Calyx hairy, segments short, triangular, acute; ripe carpels 5, with 2 long, erect, rough scales, equalling the Calyx. Seeds solitary. Radicle superior.

Parts used:—The leaves and root.

Uses:—The leaves are demulcent and refrigerant, and are useful in some cases of gonorrhœa, gleet and scalding urine.

The decoction of the root-bark and root is used as a demulcent in irritability of the bladder and in gonorrhœa, says J. Indrajī.

The root acts as a gentle tonic and diaphoretic, and is employed in mild cases of debility and fever.

The leaves are bruised in water, strained through cloth and administered in the form of a draught; the root is used in decoction, prepared in a similar manner to that of *S. caprinifolia* (MOODEEN SHERIFF).

150. *S. caprinifolia*, Linn., H.F.B.I., I. 323.

Syn.:—*S. acuta*, Burm. *S. lanceolata*, Roxb. 517.

Sans.:—Balâ Phanijivika (J. Indrajī).

Vern.:—Kareta (B. and H.); Vishaboddee (Tel.); Bariaca kareta (Hind.); Pilâ barela, koreta, bon-méthi (Beng.); Isbadi, Isarbadi (Dec.); Bala, jangli-méthi (Bomb.), Tupkaria, tukati, chikana pata (Mar.); jungli methi (Guz.); Maloconni (Malay.); Vata tirippi, malaitangi, mayir-manikkam, visha-boddi, chiti-mutti, mutu-vapulogum (TAM.)

Habitat:—Throughout the hotter parts of India and Ceylon.

A perennial undershrub, generally distributed throughout the hotter parts of India. Leaves nearly glabrous, narrow,

acuminate, serrate, about 2-3 in., linear-lanceolate; sometimes hoary beneath. Stipules linear-subulate, 2 or 3, sometimes longer than the petiole; many-nerved. Petiole $\frac{1}{16}$ - $\frac{1}{12}$ in. Peduncle jointed in the middle, as long as the petiole. Flowers:—Sepals triangular, acute. Calyx-tube subglobose. Petals yellow, twice the length of the Calyx. Staminal-tube dividing at the summit. Corolla of 5 petals, free above and connate below, and adnate to the tube of the stamens. Ovary:—Carpels 5-9, rugose, awned, whorled. Styles as many as the carpels. Stigmas terminal. Fruit a capsule. Seeds solitary, radicle superior.

Part used:—The root, juice and leaves.

Use:—By the Sanskrit writers, the roots of the different species of *Sida* are regarded as cooling, astringent, tonic and useful in nervous and urinary diseases, and also in disorders of the blood and bile (DUTT.)

In the Concan, the root is applied with Sparrow's dung to burst boils (DYMCK).

The root is intensely bitter, and is prescribed in infusion, and in conjunction with ginger, in cases of intermittent fever. It is considered by the Hindoo practitioners as a valuable stomachic and useful remedy in chronic bowel complaints; the dose, a small tea-cupful, twice daily. The leaves, made warm and moistened with a little gingili oil, are employed to hasten suppuration (Ainslie). In Bengal, the expressed juice of the leaves is used in the form of an electuary, in the treatment of intestinal worms (O'SHAUGHNESSY).

The authors of the Bengal Dispensatory, after a trial of the roots, were unable to satisfy themselves as to its febrifuge action, but it was found to promote perspiration, to increase the appetite, and to act as a useful bitter tonic. In Goa, the Portuguese value it as a diuretic, especially in rheumatic affections. They also use it as a demulcent in gonorrhœa, and Muhamadans believe this to have aphrodisiac properties (DYMCK.)

When administered in the form of a strong decoction, the root of this plant has diaphoretic, antipyretic, stomachic and

tonic properties, and has been found very useful in febrile affections and some forms of dyspepsia, and also in mild cases of debility from previous illness. (MOODEEN SHERIFF.)

151. *S. rhombifolia*, Linn., H.F.B.I., I. 323. Roxb. 517.

Sans.:—Atibalā (Sanskrit) Mahābalā, Pitapushpa.

Vern.:—Lāl-bariala or berela (Ben. and Hind.); (Sinhalese) Kotikan-bevila; (Tamil) Chittamadḍi; (Porebunder and Gujrat) Khetara ubal dana; (Marathi) Chikna, Sadeva; (Hindi) Sahadeva, Pitabala; Sahadeva. J.—Indraji.

N. B. Sahadevi (Sanskrit) is the name of *Vernonia cineria*. (K. R. K).

Habitat:—Throughout India.

A shrubby, erect herb; perennial, very variable, glabrous, or with scattered stellate hairs. Leaves polymorphous, generally more or less rhomboid, underside hoary, rarely green; tapering at the base. Stipules linear-setaceous, longer than the petiole. Peduncle longer than the petiole; rarely less than twice as long as the petiole, axillary, or clustered at the ends of the branches. Flowers mostly yellow; rarely white. Sepals deltoid, acuminate. Carpels smooth or reticulate, 10, awned or not, as long as the Calyx (Maxwell T. Masters). This species and its allies yield good fibre. Widely distributed throughout India and Tropics in both Hemispheres.

Use:—The medicinal properties of this species resemble those of other species.

152. *S. rhombifoila*, *Var. retusa*, Linn. H.F.B.I., I. 324., Roxb. 517.

Vern.:—Jangli-méthi (H. and Dec.); Ban-méthi (Beng.); Mayir-mannikkam (Tel.) *Arb*:—Hulbahe-bari. *Pers*:—Shamblide-bari.

Stems prostrate, thick and woody, much-branched. Leaves very small, cuneate-obovate, retuse, apiculate; ripe carpel,

usually with beaks, as long as themselves. Flowers yellow, becoming white when fading.

The stems afford a good fibre.

A very common weed in Ceylon in the dry country.

Use:—The root is held in great repute by natives in the treatment of rheumatism (Ph. Ind.). The stems abound in mucilage, and are employed as demulcents and emollients both for external and internal use.

153. *S. rhombifolia*, *Var. rhomboidea*, *Roxb.*
H.F.B.I., I. 324, *Roxb.* 517.

Syn:—*S. orientalis*, Cav. Diss I; t. 12.

Sans.:—Mahābalā.

Vern.:—Swetberela (B.); Sufed-bariyala (H.); Athiballachettu (TAM.)

Leaves rhomboid, hoary beneath; peduncles jointed at the base; carpellary awns very short inflected. The flowers expand at noon (*Roxb.*)

Use:—Medicinal properties resemble those of other species (*WATT.*)

154. *S. cordifolia*, *Linn.* H.F.B.I., I. 324.
Roxb. 517.

Sans.:—Batyālaka; Balā.

Vern.:—Kungyee, kharati, bariar (H.); Barila, balā (B.); Chikná (Mar.); Kharenti (Pb.); Bariāra (Sind.); Muttava, kobirsir bhaji (Konkan); chiribena, tetta gorra chettu, tella antisā, (Tel).

The seeds. Beejbund (H.); Hamaz, chukai (Pb.).

Annual or perennial, downy, erect. Leaves $1\frac{1}{2}$ -2 by $1-1\frac{1}{4}$ in., cordate-oblong obtuse crenate, very downy on both surfaces, petiole as large as the leaf. Stipules linear, half the length of the petiole. Peduncles jointed near the flower, lower distant, longer than the petioles, upper crowded, very short. Flowers rather small. Carpels furrowed at the back, sides reticulated,

10-awned, awns longer than the Calyx, covered with stiff reflexed hairs. Flowers with the other species in the rainy and cool season.

Generally distributed throughout Tropical and Sub-Tropical India. A Tropical weed.

Parts used :—The root, seeds and leaves.

Use :—A decoction of the root with ginger is given by Hindu physicians, in intermittent fever. It is also administered in fever accompanied by shivering fits and strong heat of body. The powder of the root-bark is given with milk and sugar for the relief of frequent micturition and leucorrhœa. In diseases of the nervous system the root is used alone, or in combination with other medicines. (Dutt.)

The seeds are reckoned aphrodisiac, and are administered in gonorrhœa. They are also given for colic and tenesmus (Stewart). In the Concan, the leaves, with other cooling leaves are applied in ophthalmia; the root-juice is used to promote the healing of wounds, and the juice of the whole plant pounded with a little water is given in $\frac{1}{4}$ seer doses for spermatorrhœa (Dymock.)

155. *Abutilon Indicum* G. Don. H.F.B.I.,
I. 326.

Syn. :—*A. asiaticum*, W. & A. *Sida Indica*, Linn. Roxb. 518.

Sanskrit—Atibalâ, Kankatika.

Vern. :—Kanghi, kungain, Tootree, Potaree (H.); simbul, Peelee-bootee (Pb. and Sind); Ati khirati-pala (Pb.); Potari, (B.); Miru baha (Santatl); Petari, madmi, Kanghai chakra-bhenda. (Bomb); Petari, Tupkadi, Tubocuty (Goa). Tatti, (Tam); Uram, Pettaka (Mal); Anona (Sinhalesi); Peruntutti, Vaddatuthi (Tam.). The seeds, Balbij (Bomb).

Habitat :—Throughout tropical India. Dry Country Ceylon.

A semi-shrubby annual or perennial; branches very finely downy; Leaves $\frac{3}{4}$ -1 in., broadly ovate, very cordate at base,

acute, irregularly and coarsely dentate or erose, white, with very fine, dense pubescence on both sides, especially beneath, petioles very long, 1-3 in.; jointed near top. Flowers about 1 in., nodding. Pedicel slender, jointed near top. Calyx lobes, shallow, apiculate; carpels 15-20, readily separating when ripe, sparsely and roughly hairy on back, beak short, sharp, spreading horizontally. Seeds minutely-dotted (Trimen), (Maxwell M. Masters).

Flowers orange yellow, throughout the year (Ceylon), $\frac{1}{4}$ in. diam., opening in the evening (Masters).

Parts used :—The root; bark; leaves; seeds and fruits.

Use :—An infusion of the leaves or of the roots is prescribed in fevers as a cooling medicine (Ainslie). The seeds are reckoned aphrodisiac and are used as a laxative in piles.

The seeds are burned on charcoal, and recta of children affected with thread worms are exposed to the smoke.

A decoction of the leaves is used as a mouth-wash in cases of tooth-ache and tender gums, and also in gonorrhœa and inflammation of the bladder.

In Western India, the bark is valued as a diuretic, and the seeds on account of their demulcent and mucilaginous properties (Dymock).

The infusion of the root is useful in strangury and hæmaturia.

The infusion of the root is said to be useful in leprosy. The seeds are given in the treatment of coughs.

According to the Chinese in Hong-Kong, the seeds are employed as an emollient and demulcent; the root is used as a diuretic and pulmonary sedative, and the flowers and leaves as a local application to boils and ulcers. Porter Smith states that the seeds and the entire plant are used as "demulcent, lenitive, diuretic, laxative and discutient remedies. Puerperal diseases, urinary disorders, chronic dysentery and fevers are treated with the seeds." Notes on Chinese Materia Medica by Ho Kai and Crow in Ph. J. for Oct. 22, 1887.

The leaves contain some mucilaginous substance which

they yield to hot water. Their decoction is therefore useful as a fomentation to painful parts. The seeds have a distinct control over gonorrhœa, gleet, and chronic cystitis (Moodeen Sheriff).

The juice of leaves about one *tola*, and *ghee* one *tola*, are given in catarrhal bilious diarrhœa. K.R.K.

156. *A. graveolens*, W. & A., H.F.B.I., I 327.

Vern. :—Barkanghi, bara banghi (Cawnpore). Vaḍḍāttutti. (Tam.)

Habitat :—United Provinces, Sindh, Nilgherries, Baluchistan, Central Provinces, Ceylon waste ground.

An herbaceous annual, branches covered with clammy pubescence, mixed with spreading hairs. Leaves sometimes lobed, orbicular-cordate, abruptly acuminate, velvety on both sides. Petiole almost as long as the blade; stipules linear; reflexed (falcate). Peduncles as long as the petioles. Trimen says that the flowers in Ceylon are yellowish, becoming pink when withering. Flowers large, orange coloured, with a darker centre, ultimately reflexed. Sepals ovate, acuminate; petals obcordate. Carpels 20 or more, truncate or rounded, hairy; rather longer than the Calyx, not awned.

Use :—In his Flora of the Upper Gangetic plain (p. 83), Duthie writes that the roots, leaves and seeds are medicinal. The fresh plant has often a strong and unpleasant smell. Trimen says about the same plant growing in Ceylon :—“I do not notice any scent in the Ceylon plant.” The uses are the same as those of *A. indicum*.

157. *A. Avicennæ*, Gærtn., H.F.B.I., I 327.

Syn. :—*Sida abutilon*, Linn.

(Sanskrit) Jayâ, Jayanti—J. Indraji.

Eng. :—The Indian Mallow or American Jute.

Vern. :—(Gujrat and Porebunder) Nâhani Khapât, Bhonya Kâski, Bhonya-Khapât.

Habitat :—North-west India, Sindh, Kashmir and Bengal.

An annual herbaceous, softly tomentose plant. Leaves orbicular-cordate with a long point, 3-4 in. Petiole 3 in. Peduncles 1 in., solitary, axillary. Sepals free nearly to the base, ovate, acute. Petals yellow, hardly exceeding the sepals. Staminal tube very short. Carpels 15-20, much exceeding the sepals, oblong, truncate hispidulous or pubescent, with two long horizontal spreading ciliolate awns.

Use :—Its leaves, seeds and roots are put to the same use as those of *A. indicum*.

158. *Urena lobata*, Linn. H.F.B.I., I. 329.
Roxb. 519.

Vern. :—Bun-ochra (B.); Bhidi janelet (Santal.); Bachita (N.-W.P.); Vana bhenda, Rân-tupkada; Wagdâû Bhendi (Marathi); Villiak (Konkan).

Brachta, Bachit, Bachitâ (Hindi); (Sinhalese) Valta Epala.

Habitat :—Generally distributed over the hotter parts of India. Waste open ground, Ceylon.

A very variable, herbaceous plant, more or less hairy. Leaves about 1-2 by 2-3 in., cordate 5-7-lobed, acute or obtuse; nerves 5-7, prominent on the under surface, the three central, or the midrib only, provided with a gland on the under surface; petiole usually shorter than the blade. Bracteoles oblong-lanceolate, equalling the Calyx. Flowers bright pink, darker in the centre, clustered. Carpels densely pubescent, echinate. Capsules barbed.

Use :—In Chutia Nagpur, the root is employed as an external remedy for rheumatism. (Revd. Campbell).

159. *U. sinuata*, Linn. H.F.B.I., I. Roxb.
519.

Vern. :—Lotloti, Kunjuya (H.); kunjia (B.); Mota bhedi-janelet (Santal.); Beri lât (Chutia Nagpur); Tapkote (Bomb.); Piliya Mankena (Tel.).

Jayakrisna Indrajî gives the following *Vern.* names :—(Porebunder and Gujrat) Wagdâû Bhindo; (Marathi) Lichi, Râmkapshi; (Hindi) Kânjia, Lotloti; (Sinhalese) Hiwepulâ.

Habitat :—Generally distributed over the hotter parts of India and is a weed in waste open ground in Ceylon.

A perennial herb. Stem 2-4ft., much branched, finely stellate-hairy. Leaves very variable, $1\frac{1}{2}$ -3in., rotundate, usually deeply palmately cut into 5 lobes, which are again lobed or pinnatifid, serrate, stellately hairy on both sides. Flowers bright pink, on short stout, hairy pedicels, axillary, solitary. Sepals 5, connate below into cup-shaped Calyx. Petals 5, connate and united to tube of stamens. Stamens monadelphous, anthers nearly sessile or 5-celled. Bracts a little shorter than the Calyx. Ovary 5-celled, with one ovule in each. Styles 10. Ripe carpels rounded on back, densely stellate-hairy, set with stiff long spines, with deflexed prongs at the extremities (Trimen). An oval glandular pore is situated at base of midrib, beneath, in both *U. lobata* and *U. sinuata*.

Use :—In Chutia Nagpur, the root is used as an external application for lumbago.

160. *U. repanda*, Roxb. H.K.B.I., I. 330.
Roxb. 519.

Syn. :—*U. Speciosa*, Wall.

Vern. :—Sikuar (Santal.).

Habitat :—North-West India, Upper Gangetic plain and the Western Peninsula.

Shrubby, stellate-hairy. Leaves roundish or somewhat lobed, shortly petioled, rough above, midrib glandular, at the base beneath; lower 2-2 $\frac{1}{2}$ in. long, roundish, rarely lobed, cordate at the base, repand-serrate, upper lanceolate. Flowers racemose, in alternately leafless clusters. Bracteoles $\frac{1}{4}$ - $\frac{1}{2}$ in., subcoriaceous, exceeding the membranous Calyx; 5, subulate, connate below into a cup; sepals united for half their length; Corolla pink, twice the length of the bracteoles. Carpels smooth, unarmed. Seed ascending smooth.

Use :—The root and bark are believed by the Santals to be a cure for hydrophobia (Campbell).

161. *Pavonia odorata*, Willd. H.F.B.I.,
I. 331. Roxb. 530.

Sans.:—Bālā Heivera.

Vern.:—Sugandha-bálā (H.); Kala-válā (Bomb.); Perámutiver paramutha, mudda pulagam (Tam.); Erra kuti (Tel.); Bálarakkasi, gida (Kan.); Kalo Walo (Guj.).

Habitat:—North-West Provinces, Sindh, Banda and Western Peninsula.

An erect herbaceous plant, with sticky hairs, glandular, pubescent. Leaves $2\frac{1}{2}$ by 3 in., cordate-ovate, with 3-5 shallow pointed lobes; lower petioles longer than the blades. Peduncles as long as the leaves, 1-flowered, clustered at the ends of the branches. Bracteoles 10-12, linear. Sepals lanceolate. Corolla pink, twice as long as the Calyx. Carpels obovoid, dehiscent, unarmed, wingless. Styles 10. Stigmas capitate; ovule one in each cell. Ripe carpels separating from the axis. Seeds ascending.

Part used:—The root.

Use:—The root is fragrant and aromatic, and possesses cooling and stomachic properties; used in fever, inflammation and hæmorrhage from internal organs (U. C. Dutt). According to Taylor, the root is prescribed as an astringent and tonic in cases of dysentery.

The therapeutic properties of the root are probably due to the carminative quality of the odorous matter it contains, together with the mucilaginous character commonly met with in members of N. O. Malvaceæ.

162. *Hibiscus furcatus*, Roxb., H.F.B.I., I. 335.
Roxb. 527.

Vern.:—Huligowri (Kan.); Napiritta (Sinhalese).

Habitat:—Hotter parts of India, from Bengal to Ceylon.

A large, scrambling or climbing, semi-shrubby perennial; stems more or less tomentose or glabrous, set with numerous

scattered, sharp, decurved, hooked prickles. Leaves 2-3in., roundish in outline, deeply palmately cut into 3-5 lanceolate, acute, shortly serrate segments (the lower often entire), glabrous or pubescent, usually very prickly on the veins beneath; petioles as long as or longer than leaves, stout, horizontal, cylindric, very prickly. Stipules, linear-lanceolate. Flowers large, 2½-4in.; pedicels 1-3in., very prickly; bracteoles 10-12, linear setaceous, bristly, lower half spreading or reflexed, upper half erect, with a small deflexed leafy appendage at the middle; sepals connate half way, ovate, very acute, sharp pointed, ½in., enclosed in thickened and enlarged, connivent Calyx, covered with very coarse appressed bristly hair; seed compressed, rough with scattered papillæ grey brown. Flowers yellow, with dark crimson centre. This is a very handsome climber. There seems to be no published figure of this common plant, says Trimen 1893. Talbot has done it since. (See his Forest Flora of Bombay).

Very common in Ceylon, over trees and bushes in the low country, hotter parts of India, from Bengal to Ceylon (Maxwell. T. Masters).

Use:—Roots infused in water make a cooling drink for the hot weather (Talbot).

163. *H. micranthus*, Linn., H.K.F.B.I., I. 335.

Vern.:—(Porebunder) Adbâû Buporio, Dâriânu jhâd; (Kutch), Kûrûdvel; (Tamil) Peru-maddi. (Gujrâti) Chanak Bhindo; (J. Indrajî.)

Habitat:—Hotter parts of India, from the North-West Provinces, eastward and southward to Ceylon.

Shrubby, with slender rod-like spreading branches, thinly covered with stellate bristles. Leaves ¾-1 in., ovate or oblong, quite entire or serrate, glandless, rough with bristly hairs; petioles very short. Peduncles axillary, as long as or longer than the leaves. Bracteoles linear, shorter than the Calyx. Flowers white or pink, ½ in. diam. Sepals lanceolate. Corolla reflexed. Anthers whorled. Capsule globose. Seeds cottony, variable.

Use :—In Ceylon it is valued as a febrifuge (Duthie's Flora Upper Gangetic Plain, Vol. I, p. 89).

164. *H. cannabinus*, Linn., H.F.B.I., I. 339. Roxb. 528.

Sans. :—Māchikā, Phalāmlā, Rajjuda-Ambashtā, Ambālikā. Nāli; garmikura.

Vern. :—San. (H.); Mesta-pat (B.); Ambādi (Dec.); Palungu (Tam.); Ghongu-kuru. (Tel.); Dare kudrum (Santal.); kanuriya (Orissa); kudrum (Behar); Sajjādo (Sind.); Pimdrike gida, holada (Kan.).

(Porebunder and Guj.) Bhindi Ambōi; (Marāthi) Ambādi; (Hindi) Pātsan Ambārī. (J. Indrajī.)

Habitat :—Generally cultivated; apparently wild east of the Northern Ghauts.

An annual or perennial herb. Stem glabrous, prickly. Lower leaves entire, cordate, upper deeply palmately-lobed, lobes narrow serrate; mid-nerve glandular beneath. Petiole prickly, lower much larger than the blade. Stipules linear, pointed. Peduncles very short, axillary. Bracteoles 7-10, linear, shorter than the Calyx. Sepals bristly, lanceolate, connate below the middle, with a gland at the back of each. Corolla large, spreading, yellow with a crimson centre. Capsule globose, pointed bristly. Seeds nearly glabrous. All parts agreeably acid.

Parts used :—The seeds, leaves and juice.

Use :—The seeds are used as an external application to pains and bruises, and are said to be aphrodisiac and fattening.

One tolā of the juice of the flowers, with sugar and black pepper is a popular remedy for biliousness with acidity (Dymock). The leaves are purgative.

165. *H. Sabdariffa*, Linn., H.F.B.I., I. 340.

Vern. :—Lāl-ambādi, Patwā (H. Bomb.); Mesta, (B); Lāl-ambādi (Sind.); Sivappu-kashuruk-kai (Tam.); Erra-gom-kaya (Tel.); Polechi (Mal); Arak kudrami, togat arak. (Santal.); Pulachakin, pundibija (Kan.).

Eng.:—The Roselle of India or Red Sorrel of the W. Indies.

Habitat:—Cultivated in hotter parts of India.

An erect, cultivated annual shrub, glabrous, unarmed. Stem purple. Leaves entire or 3-lobed, serrate, midrib glandular beneath; petiole 2 in. Peduncle solitary, axillary, shorter than the petiole. Bracteoles and Calyx accrescent. Bracteoles 8-12, linear, adnate to the base of the Calyx. Sepals dotted, acuminate, bristly, connate below the midrib into a purplish fleshy cup. Corolla $2\frac{1}{2}$ in. diam., yellow. Capsule ovoid, pointed, villous, shorter than the Calyx. seeds reniform, sub-glabrous.

Parts used:—The seeds, fruit and leaves.

Use:—The succulent calyx is used for the preparation of what is called in Bombay Bazaars "Roselle" jelly or Rozal jelly, and, when dried, as an article of diet like tamarind is used much in curries. In bilious conditions, a diet drink is made by boiling it with water and adding a little salt, pepper, asafoetida and molasses (Dymock).

Moodeen Sheriff recommends a decoction of the seeds as a draught, in doses of from 1 to 2 drs., 3 or 4 times a day, in dysuria and strangury, also in dyspepsia and debility.

The fruit possesses anti-scorbutic properties. The leaves are regarded as emollient. They are often cooked as vegetable and in curries. K. R. K.

The food plant roselle, *Hibiscus Sabdariffa* has recently been introduced into the Philippine Islands and is the sole representative of a type, in which the calyx supplies the chief edible portion of the plant. After flowering, the calyx thickens and enlarges until it assumes the appearance of a large bud, which is harvested for making jam or jelly of a brilliant red colour and pleasant acid taste, and for the preparation of syrup and wine. The chemical composition of the calyx is very similar to that of the cranberry, comprising *inter alia* 3.31 per cent. of malic acid, 0.83 per cent. of invert sugar, and 0.24 per cent. of sucrose. The malic acid present consists entirely of the dextro-rotatory modification, which form has never previously been identified in plant composition, and the acidity of the fruit is due entirely to it, analysis proving the absence of Tartaric and Citric acids. The roselle leaves contain about 1.25 per cent. and the stems about 0.60 per cent. of dextro malic acid, in consequence of which, both stems and leaves can be utilised in conjunction with the calyxes, when a brilliantly coloured food product is required.

166. *H. Abelmoschus*, Linn. H.F.B.I., I. 342.
Roxb. 526.

Syn.:—*Abelmoschus moschatus*, Mæneh.

Sans.:—Latâ-kasturikâ.

Arab.:—Hab-ul-mishk.

Vern.:—Kasture, kala-kasturi (B); Mushk-dânâ (H); kasturu-benda (Dec); kattuk-kasturi (Tam); karpura-benda, (Tel); kasturi-bhendâ (Mar); kapu kimissa (Singh.)

Habitat:—Throughout the hotter parts of India; most low country Ceylon. Found wild, says Trimen, or much cultivated in tropical countries.

An annual hispid, herbaceous plant, with long deflexed hair, tall, 2-3 ft. high. Leaves polymorphous, ovate-cordate or more usually palmately cut into 3-5 acute lobes, dentate-serrate, hairy on both sides; petiole usually longer than leaves, with long deflexed hairs. Stipules small, subulate. Flowers large, 3-4 in., solitary, often appearing to be terminal, bright yellow, with a purple centre. Pedicels stout, curved, much thickened beneath the flower. Bracteoles 8, distinct, linear, hispid, much shorter than Calyx. Sepals completely connate, save at their point into a tube which splits down one side. Capsule 2½-3 in., ovate-ovoid, acute, hispid; seeds kidney-bean-shaped, striate.

Parts used:—The seeds, root and leaves.

Uses:—The Hindus regard the seeds as cooling, tonic and carminative.

The Arabic and Persian writers consider them to have stomachic and tonic properties. The author of the Makhzan-ul-Adwia recommends a mucilage prepared from the roots and leaves of the plant in gonorrhœa. In Bombay, the seeds are rubbed to a paste with milk, and used to cure itch (Dymock).

In the West Indies, the seeds are given in the cure of snake-bite, being administered both internally and externally (Watt). The late Dr. Moodeen Sheriff used a tincture of the seeds and considered it stimulant, stomachic and anti-spasmodic, and recommended its exhibition in cases of nervous debility, hysteria, and a tonic for dyspepsia.

167. *H. esculentus*, Linn., H.F.B.I., I. 343.
Roxb. 529.

Syn.:—*H. longifolius*, Roxb. Fl. Ind. III. 210. *Abelmoschus esculentus*, W. and A.

English name:—Lady's finger.

Sans.:—Tindisa; Gandha-mula.

Arab. and Pers.:—Bámiya.

Vern.:—Bhindi rá-m-turai (H.); Dhénras, rá-m-torai (B.); Bhendá (Bom.); Bhindu Guz.; Bhéndi (Dek.); Vendaik-kay, vendi (Tam.); Penda, benda-káya (Tel.).

Habitat:—Cultivated throughout India.

A cultivated, annual, tall herb, with rough hairs. Leaves coarsely toothed; petiole 6 in., more or less bristly. Stipules subulate. Peduncles about 1 in. Bracteoles 1 in., linear-subulate. Flowers yellow with a crimson centre. Staminal-tube antheriferous throughout. Fruit 6-10 by lin., pyramidal-oblong, glabrescent, cells 5-8-seeded. Seeds striate, hairy.

Parts used:—The fruit, seeds and capsule.

Use:—The Mahomedan writers describe it as cold and moist, and beneficial to people of a hot temperament (Dymock).

Roxburgh recommends it in irritating cough. The mucilage from the fruits and seeds is useful in gonorrhœa and irritation of the genito-urinary system. In the Indian Pharmacopœia, the immature capsules are officinal for the preparation of a decoction, to be used as an emollient, demulcent and diuretic in catarrhal affections, ardor urinæ, dysuria and gonorrhœa.

168. *H. tiliaceus*, Linn., H.F.B.I., I. 343.
Roxb. 522.

Syn.:—*Paritium tiliaceum*, W. and A.; *Hibiscus tiliaceus*, Linn.

Vern.:—Bola, chelwa (B.); Baniá or baria (Orissa); Bel-pata (Bomb.). (Sinhalese) Beli-patta.

Habitat:—Coasts of both Peninsulas and Bengal.

A small, much-branched tree. Young shoots and inflorescence pubescent. Bark grey, inner-bark fibrous. Wood soft, grey, heartwood purplish. Leaves entire from a cordate base, nearly orbicular, shortly grey-pubescent; blade 3-8 in. diam. Petiole 1-5 in. long. Stipules broad, early deciduous. Flowers in axillary or terminal few-fid racemes. Bracteoles 10, connate, half the length of the Calyx. Corolla 2-3 in. diam., pale yellow, with a crimson centre, red in the evening. Staminal-tube $1\frac{1}{2}$ in., antheriferous all the way down. Capsule 10-celled, ovoid, pointed above, 5-valved. Seeds slightly pilose, reniform.

Parts used:—The bark and root.

Use:—The bark is used in medicine (Watt). The root is said by Irvine in his *Materia Medica of Patna* to be febrifuge, and employed in the preparation of embrocations.

169. *H. Rosa-Sinensis*, Linn., H.F.B.I., I. 344. Roxb. 523.

Sans.:—Japâ.

Vern.:—Joba, juva, oru (B.); Jasoon or jasund (H. and Dec.); shappathup-pu, (Tam.); java-push-pamu (Tel.); Dâsvâlada-huvvu (Can.); jâsût-nû-phûl (Guz); Jâsvan (Mar).

Pers.:—Angharee-hind.

Habitat:—Cultivated in gardens throughout India. I have seen 12 varieties in the Bombay gardens with cream-coloured, fawn-coloured, white and scarlet-blotched, pink, deep crimson, scarlet, with double and single-petalled flowers. It serves as a good roadside plant in Bombay. K. R. K.

A shrubby perennial plant, cultivated in gardens. Stems woody, branched, not prickly. Leaves entire at base, coarsely toothed at apex, nearly glabrous, ovate, acuminate. Stipules ensiform. Bracteoles 6-7, linear, half the length of the bell-shaped Calyx. Peduncles axillary, solitary, as long as or longer than the adjoining leaf. Sepals $\frac{3}{4}$ in.; lanceolate, connate below the middle. Corolla 3 in. diam., variously coloured with a deep purple or black blotch inside, near insertion or base of petals. Staminal-tube exceeding Corolla. Capsule roundish, many-seeded.

The juice of petals is much used in colouring sugar, confectionary pink (K. R. K.), and to 'black' leather-shoes (Masters).

Parts used:—The flowers, leaves and root.

Use:—The flowers are considered emollient, and an infusion of the petals is given as a demulcent.

The flowers fried in *ghee* (clarified butter) are administered by natives for checking excessive menstruation. The leaves are considered emollient and aperient (Murray, p. 63). The buds are employed in the cure of seminal weakness and cystitis; the root is valuable in coughs (S. Arjun).

Moodeen Sheriff reports favourably of an infusion of the petals as a demulcent and refrigerant drink in fevers (Ph. Ind).

In Bombay, the roots are dried and sold in the shops as a substitute for *Althæa*. In the Concan, the fresh root-juice of the wild flower variety is given, in doses of two tolas with milk, sugar and cumin for gonorrhœa, and the root powdered is given with an equal quantity of lotus-root and the bark of *Eriodendron anfractuosum*, in the same manner, for menorrhagia, the dose of the three being 6 māsās each. (Dymock).

Dr. Moodeen Sheriff recommended an oil, made by mixing the juice of fresh petals and olive oil in equal portions, and boiling till all water is evaporated, as a stimulating application for the hair.

170. *Thespasia populnea*, Corr., H.F.B.I., I.
345. Roxb.

Syn.:—*Hibiscus populneus*, Roxb. 522.

Sans.:—Gardhabhānda, Pārīsa, Supārshvaka.

Vern.:—Dumbla (Sundribuns); (Hindi) Pāruspīpal Gaj-dand, Pāras pipul (H.); Pores̄h, parash, pares̄h-pīpal (B.); Poris, portia, pursa Pursha-maram (Tam.); gangaraya (Tel.); Bendi (Guz.); Bhendi, Bhend (Bomb.). (Sinhalese) Suriya, (Tamil) Kavarachu, Puvarachu.

Habitat:—Tropical shores of Bengal and both peninsulas, Ceylon.

A middle-sized, evergreen, rapid-growing tree. Heartwood small, dark red, smooth; sapwood soft. Leaves cordate, acuminate, entire on both sides, with minute, peltate scales; blade 3-5 in., petiole 1-4 in. Flowers axillary, solitary or 2 together. Bracteoles none, or early deciduous. Calyx cup-shaped, truncate. Corolla yellow, passing into purplish pink when withering, 2 in. diam. Capsule dehiscent or indehiscent; $1\frac{1}{2}$ in., oblong, depressed, scaly, ultimately glabrescent. Seeds silky, pilose or powdery on the surface (Maxwell T. Masters).

Parts used:—The bark, fruit, seeds, flowers, root and leaves.

Uses:—The fruit yields a yellow, viscid juice, which forms a valuable local application in scabies and other cutaneous diseases in South India. The affected parts of the body are daily washed with a decoction of the bark (Watt). Ainslie says that a decoction of the bark is given internally as an alterative.

Dr. Waring tried it in scabies and other cutaneous diseases; in some cases, it exercised a favourable influence, but in the majority it was productive of little or no benefit.

In Tahiti, the fresh capsules, bruised and applied to the forehead are said to cure migraine; the yellow sap exuding from the peduncles is considered a cure for the bites of insects, especially of the centipede; it is also useful in sprains, bruises, and all cutaneous affections. In Mauritius, the bark is described as depurative, as used in dysentery, hæmorrhoids; the juice of the fruits being applied to warts." Christy's N. C. P., No. x., p. 43.

Rumphius speaks highly of the value of heartwood as a remedy for bilious attacks and colic, and in a kind of pleurodynia from which the Malayas often suffer.

In the Central Provinces, the root is taken as a tonic.

In the Concan, the flowers are employed in the cure of itch; and the leaves are employed as a local application to inflamed and swollen joints (Dymock).

171. *T. Lampas*, Dalz and Gibs. H.F.B.I., I. 343.

Syn.:—*Hibiscus Lampas*, Roxb. 524.

Vern.:—Bankapas (B); Bonkapsi. (Santal); Bonkapash (Assam); Rân bhendi (Mar.); Adavipratti, condapatti, rondapatti (Tel). Pârus Piplo (Guj).

Habitat:—Tropical Himalaya, from Kumaon eastwards; Bengal and the Western Peninsula.

A subarborescent, herbaceous plant, not prickly; portions downy. Leaves palmately-lobed, 5 in. diam., cordate, 3-lobed; lobes spreading, acuminate, sparingly stellate, pilose above, tomentose beneath, midrib, with a glandular pore at the base beneath; petiole $2\frac{1}{2}$ in., downy. Stipules subulate, peduncles axillary or terminal, paniced, 3-flowered. Bracteoles 4-8, subulate, deciduous. Calyx of 5-subulate, sepals, connate below the middle. Corolla campanulate, yellow, with a crimson centre. Capsule ovoid, pointed, villous, 5 rarely 4-valved or 3-valved; valves hispid, glabrescent. Seeds glabrescent.

Tropical Himalaya from Kumaon eastwards, Bengal, the Western Peninsula, Burma, Ceylon.

Use:—The root and fruit are employed in Chutia Nagpur as a remedy in gonorrhœa and syphilis (Campbell).

172. *Gossypium herbaceum*, Linn., H.F.B.I., I. 346. Roxb. 519.

Sans.:—Kârpâs.

Vern.:—Rui, kapâs (H.); Tula (B.); Parutti, (Tam.); Pratti, (Tel.). Kâpus (Mar), Kapâs (Guj.).

Eng.:—The Indian cotton.

Habitat:—Cultivated in India, Ceylon.

An annual or perennial herb or shrub, nearly glabrous or more or less hairy, and with a few scattered glandular points. Leaves cordate, 3-5; or rarely 7-lobed, usually with a gland on the undersurface of the midrib. Leaf-lobes broadly ovate or

acuminate. Stipules ovate-lanceolate, entire or slightly toothed. Peduncles shorter than the petiole. Bractcoles not divided below the middle, equalling the capsule, sometimes, entire or nearly so. Calyx truncate or obtusely crenulate, much shorter than the bracteoles. Petals spreading, ovate or crenulate. Flowers yellow, with a purple centre, rarely wholly yellow or white or purple. Capsule ovate, globose, mucronate, 3-5-valved. Seeds 5-7 in each cell, ovoid. Cotton white, brown, rarely yellowish, overlaying a greenish or greyish down. I have a fabric, a coat made out of cloth, turned out at the Thana Jail (Konkan), nearly twenty years ago out of the fawn-coloured cotton-fibre found on some plants in the Jail gardens, unexpectedly yielding the fawn-coloured cotton. It is unknown whence the seed of such plants came (K. R. Kirtikar).

Parts used :—The bark, seeds, leaves, flowers and root-bark.

Uses :—The Eastern physicians consider all parts of the cotton plant to be hot and moist; a syrup of the flowers is prescribed in hypochondriasis, on account of its stimulating and exhilarant effect; a poultice of them is applied to burns and scalds. Burnt cotton is applied to sores and wounds to promote healthy granulation; dropsical or paralysed limbs are wrapped in cotton, after the application of a ginger plaster; pounded cotton-seed, mixed with ginger and water, is applied in orchitis. Cotton is also used as a moxa, and the seeds as a laxative, expectorant, and aphrodisiac. The juice of the leaves is considered a good remedy in dysentery, and the leaves with oil are applied as a plaster to gouty joints; a hip-bath of the young leaves and roots is recommended in uterine colic.

The cotton-wool is applied to burns; the seeds are said to increase the secretion of milk, and are also said to be useful in epilepsy, and as an antidote to snake-poison. The root is diuretic, emenagogue and demulcent, and the leaves in decoction are tonic, and said to be used in fever and diarrhœa (*Atkinson*).

In India, the cotton seeds are employed to procure abortion. Cotton root-bark is officinal in the United States Pharmacopœia,

also a fluid extract of bark; it appears to have first attracted attention from being used by the female negroes to produce abortion. It acts like ergot upon the uterus, and is useful in dysmenorrhœa and suppression of the menses when produced by cold. A decoction of 4 ozs of the bark in 2 pints of water, boiled down to one pint, may be used in doses of 2 ounces every 20 or 30 minutes, or the fluid extract may be prescribed in doses of from 30 to 60 minims. Cotton-seed tea is given in dysentery in America; the seeds are also reputed to be galactagogue (Dymock).

Compared with ergot, the root of the cotton-plant causes a more natural contraction of the uterus; but the former drug appears to be the more active during parturition. *Gossypium* can be given with impunity. In gynæcological practice ergot cannot compare with *gossypium*, the rapidity of action is not so necessary, and the remedy can be given without any unpleasant secondary or after-effects, as is frequently complained of during a prolonged course of ergot subcutaneously or *per os*." (*I. M. G.*, November, 1884. pp. 334-5).

The herbaceous part of *Gossypium herbaceum* contains much mucilage, and is used as a demulcent.

Cotton-seeds have been employed in the Southern States of America with great asserted success in the treatment of intermittents. A pint of the seeds is boiled in a quart of water to a pint, and a teacupful of the decoction is given to the patient in bed, an hour or two before the expected return of the chill. (*U. S. Dispensatory*).

The seeds are considered a nervine tonic and are given in headache, etc.

Cotton-seed is said to increase the secretion of milk, and cotton-seed oil is largely utilized for this reason in the feeding of cows. The reason of this physiological action, and the constituent of the seed which produces it, are not known. In order to apply this to women, attempts have been made to purify the seeds, and a preparation, bearing the name of lactagol, has been the outcome of these investigations. It is a fine white powder, having a not

unpleasant taste. The patients take it well, and it does not produce any disturbances of digestion. The action on the breast becomes evident after the patient has taken the powder for three or four days and has swallowed from 25 to 30 grams. The effect on the breasts is that they become fuller, that the baby is able to suck for a longer period, and that at the end of the meal the mother does not complain of pain in the breasts. The action does not appear to be lost if one discontinues the lactagol for one day, but if one leaves it off for two or three days the secretion becomes less. If one uses it in women, who have already been suckling for some time, one finds it necessary to give nearly double the amount before the action is obtained.—B. M. J. Epitome, August. 6, 1904.

The flowers contain a coloring matter, a glucoside, named *gossypetin*, $C_{18}H_{14}O_8$. It forms glistening, yellow needles, closely resembling quercetin in appearance, and is readily soluble in alcohol, but only very sparingly in water. Concentrated alkaline solutions dissolve it, forming orange-red solutions, which, on agitation and dilution with water, become green, and finally assume a dull brown tint. Ammonia behaves very similarly. Alcoholic lead-acetate gave a deep red precipitate in the cold, passing into dull brown at the boiling point, and alcoholic ferric chloride a dull, olivegreen liquid. Sulphuric acid dissolves it, forming an orange-red solution.

Fusion with alkali.—When *gossypetin* is fused with caustic potash at $200-220^{\circ}$ two crystalline decomposition products are obtained, melting at 210° and at $194-196^{\circ}$ respectively; these consisted of *phloroghucinol* and *protocatechuic acid*. J. Ch. S. 1899 T., p. 825.

When the phenolic constituents of cotton-seed oil are purified by repeated fractionation from acetic acid solution, a crystalline product is obtained which can be further purified by crystallisation from a mixture of alcohol and dilute acetic acid; this substance, to which the name of *gossypol* is given, has a composition corresponding fairly well with that required for the formula $C_{13}H_{14}O_4$.

Gossypol crystallises in glistening, golden scales, melts at 188° , dissolves readily in alcohol benzene, chloroform, ether, acetone, or acetic acid, but not in water. Sulphuric acid dissolves it with a beautiful, cherry-red coloration, similar to that observed with impure cotton-oils. Alkalis give a yellow

solution, which soon becomes violet and then gradually loses its colour; the violet colour is developed immediately when hydrogen peroxide is added to the alkaline solution. Alkaline solutions of gossypol reduce both Fehling's solution and ammoniacal silver nitrate. An alcoholic solution gives a dark green coloration with ferric chloride, which becomes dark reddish-brown on adding alkalis. The acetyl and benzoyl derivatives are very soluble in organic solvents, and were not obtained in crystalline form; bromine and nitric acid also act on gossypol, but definite products were not isolated. Gossypol is not a glucoside. An analysis of the lead salt indicates the presence of two hydroxyl groups. Gossypol gives a grey shade, with iron mordants.—J. Ch. S. 1890 A I. 821.

173. *G. arboreum*, Linn. H.F.B.I., I. 347.
Roxb. 520.

Vern :—Nurma, deo kapas. (H.); Budi Kaskom, bhoga kuskom (Santal.); Manna, radhia, nurma (N.-W. P.); Kapas (Pb.); Deva Kâpusa (Mar.); Samparuthi (Tam.); Patti (Tel).

Habitat :—Plains of India, in gardens, but generally cultivated.

Arborescent or shrubby plant, rarely an herb. Branches purple, pilose. Leaves nearly glabrous, one-glandular, deeply palmately 5-7-lobed, lobes linear oblong, mucronate, contracted at the base, often with a supplementary lobe in the sinus. Stipules ensiform. Flowers purple, rarely white. Bracteoles nearly entire, cordate, ovate, acute. Petals spreading; staminal-tube antheriferous for its whole length. Capsule about 1 in., oblong, pointed. Seeds free, covered with white wool overlying a dense, green down. Cotton not readily separable from the seed.

Uses :—In Bombay, the root is used in the treatment of fever.

In the Konkan, the root, rubbed to a paste within the juice of patchouli leaves, has a reputation as a promoter of granulation in wounds, and the juice of the leaves, made into a paste with the seeds of *Vernonia anthelmintica*, is applied to eruptions of the skin following fever. In Pudukota, the leaves ground and mixed with milk, are given for strangury (Dymock).

The petals squeezed and soaked in human or cow's milk,

are used as a soothing and effective application for conjunctivitis of infants (Dr. Thompson in Watt's Dictionary).

The cotton is a very useful external remedy in burns, scalds, and some other surgical diseases. The seeds exercise some good influence over gonorrhœa, gleet, chronic cystitis, consumption and some catarrhal affections. The fresh young capsules and shoots have been observed to produce good effects in some cases of dysentery and gonorrhœa. The control of the seeds over gonorrhœa and gleet is more manifest when combined with some other drugs, a prescription for which is given below.

Take of the *cotton seeds*, from two to four drachms; fruit of *Cuminum cyminum* (cumin seeds), from one and a half to three drachms; fruit of *Pimpinella Anisum*, (anise seed), from one to two drachms; and the *silicious concretion* of *Bambusa arundinacea* (tabshir), from fifteen to thirty grains. Bruise and rub all these ingredients well in a stone mortar, with three or four ounces of water and pass the liquid through cloth. This draught is to be used four or five times in the twenty-four hours, according to the severity of the symptoms (Moodeen Sheriff).

174. *Kydia calycina*, Roxb. H.F.B.I., I. 348; Roxb. 521.

Vern.:—Polâ, pûlâ, pulipatha, potari, choupultea (H.); Baranga, bhotti. (C.P.) Kûbinde (Nepal.); Potri, pandini, podda, kunji (Tel.); Boldobak (Garo); *Vâranga*, *varangada*, *warung*, *moti*, *potârî* (Bomb.); *bittia gonyer*, *pata dhamin* (Kol); *Poshka olat*, (Santal.); *Derki* (Karwar); *sedangtaglar* (Lepcha); *kopâsia* (Uirya); *Pulli*, *pûla*, *polâ* (Pb.); *Bendi*, *bende-naru*, *bellaka* (Kan.); *Buruk*, *bosha*, *kunji* (Gond.) *nihoty Lirwani* (Guj.).

Habitat:—Tropical regions of the Himalaya, from Kumaon eastward, and throughout the Western ghats. Dun and Saharanpur gardens. Burma.

A moderate-sized, deciduous tree or large shrub. Bark grey, exfoliating in large strips, rough, with large white specks on

branches. Young parts covered with grey stellate hairs. Leaves downy beneath, 4-6 in. by 3 in. diam., rounded, cordate, palmately 5-7-nerved, more or less lobed, midlobe longest, glabrous above or with thinly scattered hairs, closely felted beneath; petiole 1-2 in. Flowers numerous, white or pink, $\frac{1}{2}$ - $\frac{3}{4}$ in. across, polygamous, generally dioecious, in much-branched axillary or terminal panicles. Bracteoles 4-6, oblong, spathulate, downy, nearly as long as the Calyx; Calyx campanulate, 5-lobed, segments ovate, acute, accrescent and spreading in fruit, Petals clawed, adnate to the staminal-tube, longer than the Calyx, obcordate. Stamens monadelphous, the tube shorter than the petals and split halfway into 5 segments, each bearing at the apex 3-5 sessile anthers. Capsule subglobose, 3-valved. Seeds reniform, furrowed.

Use :—Among the Santals, the leaves are pounded and made into a paste and applied to the body for pains. They are also chewed, when there is a deficiency of saliva. (Revd. A. Campbell.)

175. *Adansonia digitata*, Linn. H.F.B.I., I. 348. Roxb. 513.

Vern.—Gorakh amli, amali, (H.); kalp briksh (Ajmere); Hathi-khatyan (Dec.); gorakh chintz, choyari chinch (Bomb.); Marjath Anai-puliyaroy Parutti, (Tam.); Sima-chinta (Tel.) Gorakh Amli (Porebunder); Rukhdo, Chor Amli (Guj.); Gorakh Chinch (Marathi); Katu-imbul (Sinhalese).

Arab. :—Hujed.

Eng. :—The baobab or monkey-bread tree of Africa.

Habitat :—Cultivated in various parts of India and Ceylon.

A deciduous large tree, 60-70 ft. high, very handsome, though stumpy when in foliage. Trunk short, thick, of great diam. Stem grey at base, rapidly narrowing upward, like a cone, throwing out very widely spreading branches. Bark soft, glaucous, thick. Leaves digitate, glabrous, pubescent beneath, when young; leaflets generally 5-7, 3-4 in. long, obovate or

oblong-lanceolate, acuminate, attenuated at base, entire or sinuate at the margins. Flowers white, solitary, axillary, pendulous, long-peduncled (often more than 12 in.). Bracteoles 2. Calyx thick, coriaceous, fleshy, cup-shaped, 5-cleft, tomentose (?) externally and clodded with silky hairs internally. Petals obovate, adnate below, to the stamens. Staminal-tube thick, dividing above into numerous filaments; anthers long, linear, reniform or contorted, 1-celled. Ovary ovoid. Style long, filiform, divided at summit into as many radiating stigmas as there are cells to the ovary. Cells of ovary 5-10. Fruit pendulous, oblong-obovoid, downy, woody, brownish-green, indchiscent, 8-12 in. long. Seeds about 30, kidney-shaped, brown, immersed in tough fibres and a mealy, reddish fawn-coloured, slightly acid pulp, which becomes powdery as the pulp matures.

Trimen says the Roman Catholics call it "Judas' Bag," because the fruit contains 30 seeds." Mr. Crawford of Ceylon Civil Service gives the circumference of the largest stem (in 1890) as 61 ft. 9 in., whilst the tree is only 30 ft. high. A tree at Puttalam, in Ceylon, is mentioned by Emerson Tennent as being 70 ft. in height and 46 ft. in girth (1848). In the village of Matunga (Bombay), in 1896, along the principal road going to Sion Hill, there was a large tree on the left hand side, of a similar enormous size. In the Thana District, I have seen several such trees in a Mahomedan graveyard on the right hand side while going from Thana by the Colset public Road to the Colset Bunder. Similar trees are mentioned as growing in Bengal. Originally, a Native of Tropical Africa, it was introduced into India and Ceylon by Arabian traders. It is now a naturalized plant, and grows all over India, along the coast of Gujrat, Central Provinces, Bengal. Into Ceylon also it was introduced by the Arabs. The Baobab trees, at Mannar have long been well-known.

The disproportionately large, short trunk is remarkable. The wood is pale-coloured, soft and porous. It is said by Lisboa that the pulp is refrigerent and diuretic. The bark has been proposed as a substitute for quinine. Its liber affords excellent fibre. The pulp of the fibres is used for paper-manufacture.

The following was said by Major Kirtikar at the Melbourne Medical Congress, in exhibiting an extract from the bark prepared by the late Mr. M. C. Periera of Bandra :—About 30-40 grains a day, in small doses, are given every third or fourth hour in Intermittent Fevers. The fruit pulp is acid and makes a very pleasant refrigerent drink. When unripe, the fruit pulp is mucilaginous, but as it gets ripe, it assumes the appearance of dry pith, containing dry, powdery, acid, starch-like stuff, enclosed in bundles of fibre and surrounding the seeds. Walz has extracted an active principle from the Bark, called Adansonin. The pulp is an astringent in diarrhoea, like gallic acid.

Parts used :—The fruit, bark and leaves.

Use :—It was introduced into India by the Arabians. In Africa, it is used for dysentery, and the leaves are made into poultices and used as a fomentation to painful swellings, or the leaves dried and reduced to powder are called *lalo* by the Africans, and are used to check excessive perspiration. (Royle.) Duchassing recommends the bark as an antiperiodic in fever. In Bombay, the pulp, mixed with butter-milk, is used as an astringent in diarrhoea and dysentery. In the Concan, the pulp with figs is given in asthma, and a sherbet made of it, with the addition of cumin and sugar, is administered in bilious dyspepsia. It is also given for this affection with Emblic myrobalans, fresh mint, rock-salt, and long pepper. (Dymock.)

The fruit has been analysed by Messrs. Heckel and Schlagdenhauffen. The authors think that the pulp is rightly used by the natives as a remedy in dysentery.

The pulp is beneficial in pyrexia of any form of fever, by diminishing the heat and quenching thirst. It has recently proved itself very successful in relieving the night-sweats and febrile flushes in a severe case of consumption. The bark is useful to some extent in simple and in complicated cases of continued and intermittent fevers (Moodeen Sheriff.)

176. *Bombax Malabaricum* D.C., H.F.B.I.,
I. 349. Roxb. 514.

Syn. :— *B. heptaphylla*, Roxb.

Sans. :—Shālmali; mochā. Rakta Shālmali. Mahā vriksha, Panch-parni, kalpa vriksha.

Vern. :—Semul or Sēmal, shembal, semur, pagun, somr, ragat-seūbal, ragat-sēmar, kânti-sēubal (H.); Rokto-simul, simul (B.); simbal, shivlan (Pb.) Del (Kol); Edel (Santal); Bouro, (Uriya); Boichu, panchu (Naro); Sunglu (Lepcha); Sānvāri Kāntesava saer, somr, semuel, shembal, (Bom.); Lāvāra, Simbo, samar, kante-savar, kanteri samar, shevari, tamari savari, (Mar.); Rato-shemalo, shemolo, shimlo, shimul shimar, (Guz.); Kānton-Kā-Khatyan, kanto-kā-sēmul, lāl-katyan (Dek); Mundlabūragachettu (Tel.); Pulā, Mul-ilava-maram, mulilaun (Tam.); Pula-maram, mul-lilava, mullia-pūla (Mal); Mullu-būragam-arā, burla, (Kan.); Wallaiki (Gond.); Katseori (Bhil.).

Habitat :—Tropical Eastern Himalaya, and throughout the hotter forest regions of India, Ceylon, Burma, Sumatra.

A very large deciduous tree, with branches in whorls, 5-7, spreading horizontally, and stem with buttresses at base. Bark grey, when young, with conical prickles, with corky base, when old with long irregular vertical cracks. Wood white when fresh cut, turning dark on exposure, very soft, perishable. No heartwood, no annual rings. Leaves digitate, glabrous. Leaflets 5 or 7, lanceolate, 4-8 in. long, common petiole as long as or longer than the leaflets. Flowers appearing before the leaves, large, scarlet, occasionally white; Calyx inside silky—tomentose. Petals 2-3 in. long, stellate-tomentose on both faces. Filaments numerous, pluri-seriate, much longer than the staminal column; 5 innermost forked at the top, each with an anther, 10 intermediate shorter, outer very numerous (Maxwell T. Masters). Brandis says the filaments are about 70; the numerous outer ones united in 5 clusters. Anthers long, afterwards twisted. Petals 5, oblong, recurved, fleshy, twice the length of the stamens. Style longer than the stamens. Capsule 6-7 in., oblong, hard, woody, downy, 5-valved. Valves silky within.



Seeds glabrous, embedded in silky wool. This is the silk-cotton tree of the Konkan.

Parts used :—The gum, seed, fruit, tap-root, bark, cotton and flower.

Uses :—The gum or dried juice, *mocha-ras*, which the tree yields, is used as an aphrodisiac. The root has stimulant and tonic properties. The bark and the root are emetic. The young roots, dried in the shade and powdered, form the chief ingredient in the *músla-semul*, a medicine highly thought of as an aphrodisiac; it is also given in impotence. The gum contains a large proportion of tannic and gallic acids, and may be successfully employed in cases requiring astringents. The gum has also tonic and alterative properties, and is used in diarrhoea, dysentery, and menorrhagia.

The dry flowers, with poppy seeds, goats' milk, and sugar, are boiled and inspissated, and of this conserve two drachms are given three times a day in hæmorrhoids (Medical Topography of Dacca, by Dr. Taylor).

" Its gum is useful in diarrhoea; dose : 20-30 grs., with equal parts of sugar (Surg. T. Anderson, Bijnor). The taproot is used for gonorrhœa and dysentery (Mukerji, Cuttack). The leaves, singed and beaten, or rubbed with water to a pulp, make a useful application to glandular swellings (Forsyth). Watt's Dict. i. 491.

The gum is astringent and demulcent; the seeds nutrient and demulcent; the young fruit stimulant, diuretic, tonic, aphrodisiac, expectorant, and exercises a great beneficial influence over the membranes of the genito-urinary organs; the tap-root is demulcent, tonic, slightly diuretic, and aphrodisiac; the bark is demulcent, diuretic, tonic, and slightly astringent; and the cotton is employed only externally for its mechanical properties (softness and elasticity) in padding splints and covering burned and inflamed surfaces, &c.

The gum is useful in diarrhoea, dysentery and other affections in which kino and catechu are beneficial. The therapeutic uses of the seeds are similar to those of the seeds

of *Gossypium herbaceum*, *G. Arboreum* and *G. Barbadense*. The benefit of the dry young fruits in calculus affections and chronic inflammation and ulceration of the bladder and kidneys, including strangury and all other forms of dysuria, except those depending on mechanical causes, is remarkable. The fruits are also useful in weakness of the genital organs and in most of the disorders in which gentian and calumba are resorted to. As therapeutic agents, the tap-root and the bark, in the forms of decoction and extract, are nearly identical in their usefulness with *Mārâtimoggu*, and therefore employed in almost the same affections. The cotton of *B. Malabaricum* is useful in all the surgical cases, &c., in which the cotton of *Cochlospermum Gossypium* is employed, and the manner of using it is also the same.

There is no drug in India which enjoys a greater reputation as an aphrodisiac and tonic in native medical works than the tap-root of the young plant of *B. Malabaricum*. There is no doubt that it is one of the useful drugs in this country, but the exaggeration of its good effect in some of the Indian writers is so great, that it is quite ridiculous and not worth mentioning here. I have recently given a trial to this drug in my practice, and found it to be a good demulcent tonic, and slightly aphrodisiac, but nothing beyond it. I may also state that even the good influence, which it does exert occasionally on the genital organs, is neither certain nor uniform. The great practical objection to the use of the *Semal-mush* is that it is neither sold in the bazar, nor procurable always in any garden or field. Besides, there is no medical property in it, which, according to my own experience, is not possessed in equal degree, if not more, by the dry young fruits and bark of *B. Malabaricum*. In fact, the *Marâti-moggu* is not only the cheapest and most abundant, but also the best and most useful of all the parts of the above plant which are used as medicines. The young fruits seem to possess some soothing or special action on the mucous membrane of the genito-urinary tract, and have therefore proved themselves more useful than Pareira Brava in some of the diseases in which the latter is indicated (Moodeen Sheriff).

"The gum exudes only from those portions of the bark which have been injured by decay or by insects, since incisions in the healthy bark do not cause the gum to flow. The gum first exudes in the form of a white, opaque, viscous mass, which readily turns red, and finally dries into hard, brittle, mahogany-coloured tears, the larger of which are hollow in the centre, the cavity being produced during the gradual drying of the jelly-like mass which first exudes from the tree. The fresh exudation contains about 84 per cent. of moisture which it loses on drying in air. The gum is best collected during the early part of the hot season—from March till June—since it has then lost most of its moisture, and consequently is less liable to ferment and deteriorate when it is stored.**

"*Chemical properties of the gum.*—The gum contains a considerable quantity of tannin and belongs, in fact, to that class of tannin materials which Procter has classified as being of 'mixed and doubtful constitution.' It contains also catechol tannin."

"*Hydrolysis of the gum.*—Boiling the original substance with dilute acid, probably hydrochloric acid, yields a red coloured solution, together with an insoluble residue which possesses the colour of crimson lake. For brevity's sake this amorphous product will be referred to as '*Semul red.*' It is only very moderately soluble in alcohol, and, therefore, this colouring matter does not possess the solubility ordinarily attributed to the phlobaphenes. The filtrate from the hydrolysis deposits a small quantity of a dark red, amorphous powder, and if the tannin substances be removed by means of precipitation with lead acetate, and the excess of lead in solution be removed from the filtrate by means of sulphuretted hydrogen, then the residual liquid, freed from sulphuretted hydrogen, will reduce Fehlings' solution."—J. Ch. I 29-4-1911 p. 469.

177. *Eriodendron anfractuosum.*, D.C. H.F.B.I.,
I. 350.

Syn. :—*Bombax pentandrum*, Roxb. 513.

Vern. :—Safed simal, senibal, hatian (H); Swet Simal (B.); Ilavam (Tam.); Buruga, pûr, buraga-sânnâ (Tel.); Paniâ, paniala (Mal.); Khatyan, safed-khatyan (Dec.); shamicula, sapheta sâvara, shâlmali, pandhari sâvar (Mar.); Biliburga, bili-barlu (Kan.).

Habitat :—Forests, throughout the hotter parts of India, Ceylon. Native of Malay.

A moderate-sized, deciduous tree. Bark greyish brown, green when young, peeling off in round bosses. Wood yellowish or brownish white, soft. Trunk straight; the primary branches horizontal, in whorls of three; young parts, glabrous. Leaves

closely placed, on long glabrous petioles, digitate; leaflets 5-7, on short, winged stalks, 3-5 in., lanceolate, acute at both ends, finely cuspidate, entire or serrulate near tip, glabrous, paler beneath, stipules $\frac{1}{2}$ in., linear-filiform, deciduous. Flowers cream-white, faintly scented; $1\frac{1}{2}$ -2 in., in axillary clusters of 2-8, appearing with the young leaves at the ends of branches, drooping; pedicels about 1 in., no bracteoles. Calyx $\frac{1}{2}$ in., tubular-campanulate, with very shallow lobes, glabrous outside, lined with dense appressed hairs at the base within; petals twice as long as Calyx, spreading, obovate-oblong, acute, densely tomentose outside, nearly glabrous within. Stamens a little longer than the petiole, erect. Ovary glabrous. Capsule $3\frac{1}{2}$ -4 in., surrounded at base by persistent Calyx, ovoid-fusiform, blunt, tardily dehiscent from base upwards by 5 septifragal membranous valves, 5-celled, cells densely lined with long white silky hair which is deciduous, so that the valves are ultimately glabrous and areolate within. Seeds over $\frac{1}{4}$ in., compressed-globose, quite glabrous, blackish, each surrounded by a copious crumpled mass of silky hair. Though each seed appears to have a separate investment of cotton, this is quite unconnected with the testa and really arises from the inner side of the wall of the capsule and from the central axis. It is ultimately separated from these, and is then a mere stuffing round the seeds. This silk-cotton is called Kapok in Malay. A bright red gum is afforded by the stem.

Uses:—The tree yields a gum, called *Hatyan gond*, which is astringent and used as a remedy for bowel complaints (Watt.)

The unripe fruits are regarded as demulcent and astringent.

The roots are also used medicinally, like those of *Bombax Malabaricum* (which see).

"The leaves are ground into a paste and administered in gonorrhœa" (Surgeon Thomas).

"The gum is also used in the incontinence of urine of children" (Surgeon-Major Ratton.)

"The root of the young plant is also used in cases of ascites and anasarca, when it acts as a diuretic." (Dr. Thornton) Watt's Dictionary.

The Kapok tree, *Eriodendron anfractuosum*, grows in almost all tropical countries and resembles the cotton plant, in that it yields a fruit containing fine fibrous material in which the seeds are embedded. The East Indian tree, *Bombax malabaricum* is also known as "kapok" and in commerce no distinction is made between the oils derived from these two sources. The seeds contain about 23 per cent of oil, and yield about 17 per cent by pressing. Expressed oils yielded by 'kapok' seeds from Java, East Africa, Ceylon, and Ecuador had the following characters: sp. gr. at 15°C. 0.9235 to 0.926; refractometer reading at 40°C. 51.7 to 59.7; iodine value, 85.24 to 93.78; saponif. value 189.2 to 194.5. Reichert-Meissl value, 0.20 to 0.66; Polenske value, 0.40; acid value, 18.5 to 210.2; insoluble fatty acids, 95.60 to 95.76 p. c. The fatty acids had: iodine value, 86.8 to 98.96; saponif value, 199.0 to 202.7; solidif pt., 26.9°C to 31.8°; m. pt., 32.2 to 34.2°. The expressed oil from *Bombax* seeds had: sp. gr. 0.9300; refractometer reading at 40°C., 57.0; iodine value, 73.59; saponif value, 194.3; acid value, 30.; insoluble fatty acids, 95.61 p. c. The fatty acids from kapok oil yield a hexabromide melting at 112° to 114°C. Kapok oil resembles cotton seed oil, and gives a strong reaction with Halphen's reagent; it is not, however, used so extensively as cotton seed oil for edible purposes.—*J. C. Ind. September 15, 1913. Page 874.*

The air-dried kapok seeds contain 25.6 per cent of fatty oil. The oil does not become entirely clear till warmed to 28°-29°C. The sp. gr. at 15°C is 0.9218 for expressed commercial oil, and 0.9198 for extracted oil. The refractive index at 40°C is 1.4630. When dissolved in toluene, the oil is optically inactive. In Engler's viscometer, the viscosity is 11.5 at 20°C. compared with water. The iodine value of the expressed oil was 88.7, and 93.3 to 94.5 for the extracted oil. The acid values were 21.6 for expressed oil and 34.4-6 for extracted oil. The saponification values were 192.3 for the expressed oil, and 196.3 for the extracted oil. The acid values were 21.6 for expressed oil and 34.4-6 for extracted oil. The saponification values were 192.3 for the expressed oil and 196.3 for the extracted oil. The Reichert—Meissl value was 0.8, and the Polenske value varied between 0.14 and 0.34. The fatty acids melted at 34°-35°C, and when freed from phytosterol they melted at 36°C. Characteristic reactions were obtained by the Halphen, Becchi and nitric acid tests. The oil did not show any drying properties. It was found to consist principally of the triglycerides of palmitic, oleic, and linolic acids. A small amount of a phytosterol, m. pt. 136°C was isolated.—*J. C. Ind. September 30, 1913, page 917.*

N. O. STERCULIACEÆ.

178. *Sterculia foetida*, Linn. H.F.B.I., I. 354, Roxb. 510.

Vern.:—Jangli-badám (H. and M.); Jungli-badám, pún (Bomb.); Kuo-mhad, virhoi (Goa); Goldaru, nágalkuda (M); Pinári, kuddurai-pudduki, kudra-plukku, pinari-marum (Tam.); Gurapu-badam (Tel); Bhatala penari (Kan.)

Habitat:—Western and Southern India, Burma, Ceylon.

A large deciduous tree. Bark thin, white. Wood grey, spongy, soft. Branches whorled, horizontal. Leaves digitate, crowded at the ends of branches. Leaflets 7-9, elliptic lanceolate, about 6 by 2 in., pubescent when young, adult glabrous beneath. Petioles 3 in. Stipules ensiform, caducous. Panicles erect, numerous-flowered, spreading (formed immediately under the leaves of the present year, Roxb.), branches glabrous, ultimate pedicels shorter than the flower, jointed in the middle. Bracteoles minute. Flowers polygamous, red, yellow or dull purple. Calyx deeply 5-parted, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., dull orange coloured, campanulate; lobes oblong-lanceolate, spreading, villous within, much longer than the tube. Anthers 12-15. Carpels 5 downy; style curved. Follicles as large as the fist, woody, scarlet, oblong, boat-shaped, shortly beaked, villous inside, nearly glabrous outside. Seeds black, 10-15, in each follicle. Cotyledons thick, fleshy; albumen 0.

Flowers dull orange. Smelling most offensively, with the odour of carrion. The great pendulous bright red follicles gaping open and showing the black seeds which are very striking objects (Trimen). The seeds are eaten roasted.

Parts used:—The leaves, seeds and follicles.

Uses:—The leaves are considered as repellent and aperient. Loureiro informs us that the seeds are oily, and when swallowed incautiously they bring on nausea and vertigo. Horsfield adds that the capsule is mucilaginous and astringent. (Ainslie.)

179. *S. urens*, Roxb. H.F.B.I., I. 355, Roxb. 507.

Vern.:—Gúlú, kúlú, gúlar, buli (H.); Odla (Ass.); Pánd-rúka, kándol, karái sárdol, sárdora (Bomb.); Makchúnd; Gur-

karanj (*Mundari*), Tele (*Ho*); Búrkúnda (*Mundari*) (Bomb.); Kavalee talbsu (Tel.); Vellay pútali (Tam.); Kalru (Ajmir).

Habitat :—N. W. India, Assam, Behar, Eastern and Western Peninsulas, Ceylon dry country.

A large deciduous tree. "Bark $\frac{1}{2}$ in. thick, very smooth, white or greenish grey, exfoliating in large thin irregular papery flakes. Wood very soft, reddish brown, with an unpleasant smell, with light coloured sapwood, always feels wet or oily. Pores large, often oval and sub-divided, very scanty, frequently filled with gum. Medullary rays moderately broad, on a radial section prominent as long, dark undulating bands, giving the wood a mottled silver-grain; the distance between the rays is larger than the transverse diameter of the pores. Alternate dark and light concentric bands across the rays" (Gamble). The bark gives good fibre. The colloid gum is called Katira. Leaves crowded at the ends of branches, tomentose beneath, nearly glabrous above; simple, cordate, shallowly-palmately-5-lobed; lobes entire, acuminate, blade 8-12 in., petiole 6-10 in. long. Flowers yellow, small, in crowded, erect, more or less pyramidal dense panicles, clothed with a dense sticky tomentum of glandular stellate hairs; a few flowers bisexual, mixed with a large number of male flowers. Staminal-column short; anthers about 20. The gynophore short, thick. Calyx $\frac{1}{4}$ in. diam., campanulate, 5-parted, lobes acute, spreading. Fruit 4-5 follicles, yellow-pubescent, sessile, radiating, ovoid, thickly coriaceous. Carpels, 3 in. long, red when ripe, covered outside with stiff stinging bristles. Seeds 3-6 in each carpel, oblong, dark brown. This tree is often associated with *Boswellia* throughout the Peninsula (Brandis).

Uses :—The leaves and tender branches steeped in water yield a mucilaginous extract, useful in pleuro-pneumonia in cattle (Watt.)

The gum, known as *karai-gond*, is used as a substitute for tragacanth in Bombay (Dymock).

The Santals consider the gum a useful medicine in throat affections. (Revd. A. Campbell.)

Causes intolerable itching, if touched or handled; oil removes the hairs, and the itching, effectually (J. J. Wood's Plants of Chutia Nagpur, p 85)

180. *S. scaphigera*, Wall. H.F.B.I., I. 361.

Habitat :—Chittagong.

A tall, deciduous, glabrous tree. Leaves glabrous, oblong-lanceolate, 1-nerved, 12-14 by 6 in., coriaceous, base rounded. Petiole 4-5 in., thickened at the top. Flowers paniced. Calyx $\frac{1}{4}$ in., pilose, campanulate, five-parted, lobes reflexed. Male flowers:—Stamens 10-15. Anthers 16-15, pilose. Ovary villous on a long slender stalk, 2-celled, with a ring of sessile anthers at the base. Style filiform; Stigmas 2-lobed, subcapitate. Follicles large, leafy, boat-shaped, dilated at the base, opening long before maturity, at first pilose, ultimately 6-8 by 3-4 in., venose-reticulate, 1-2 seeded. Seeds globose, solitary, albuminous; cotyledons pale-green, radicle next the hilum.

Part used :—The fruit.

Use :—The fruit is used in China as a remedy for dysentery.

181. *Helicteres isora*, Linn., H.F.B.I., I. 365., Roxb. 506.

Sans. :—Avartani.

Vern. :—Marosi, marorphali, jonka-phali, kapási, bhendu (H.); Antamorá (B.); Vurkatee (Sind.); Dhameenee (Dec.); Murad Shing (Maráthi); Kawun (Bomb.); Aita (Gond); Valumbirikai (Tam.); Gubadarra (Tel.)

Habitat :—Dry forests throughout Central and Western India, from Behar as far west as Jammu, and the Western Peninsula. In the Thana Adawlat Garden (1881) there is a beautiful plant six feet high. K.R.K. Ceylon low country.

Arborescent or shrubby. Leaves 3 by 2½ in., bifarious, obliquely cordate, roundish, obovate, often lobed, shortly acuminate, serrate, scabrous above, pubescent beneath; petiole $\frac{1}{4}$ in., as long as the linear subulate stipules. Peduncles 2-3 together, in a short axillary cyme. Bracteoles small, subulate. Flowers

1½ in. Calyx gibbous, laterally compressed, somewhat 2-lipped. Petals reflected, red at first, fading to lead colour, very unequal in size, 2 lower the largest, claw winged. Staminodes 5 emarginate scales. Stamens 10, anthers ovate. Ovary at the top of the Staminal-column, 5-lobed, 5-celled. Styles awl-shaped, more or less united, slightly thickened and stigmatose at the tips. Ovules many in each cell. Follicles spirally twisted, cylindric, beaked, pubescent.

Parts used :—The fruit, root, and bark.

Uses :—The fruits are made into liniment for sores of the ear (Ainslie.)

They are also internally administered for colic, according to the ancient "doctrine of signatures."

Sloane speaks of the juice of the root having virtues in empyema and stomach affections. Leaves are used in Jamaica for decoction for clysters (Murray.)

In the Konkan it is used in snake-bite and diabetes (Dymock). It is also used in an thelmintic diarrhœæ, dysentery. Dose of powdered bark one wâl* to ¼ tola.

The root and bark used by the Santals for the same purposes as the fruit (Rev. A. Campbell.)

According to Moodeen Sheriff, it is demulcent and mild astringent, and useful with other drugs in the griping of bowels, and flatulence of children.

182. *Pterospermum suberfolium*, Lam, H.F.B.I., I. 367.

Syn. :—*P. canescens*, Roxb. 512.

Sans. :—Moochukunda.

Vern. :—Muchukunda, muskunda (B.); Bælo giringa (Uriya); Lolagu (Tel.); Taddo (Tam.); Muchkand (H. and B.); Naji (Burm.); Vengeance, venangu (Sing.); Muchkund (Marathi).

Habitat :—Western Peninsula (Konkan and Kanara). Forests of Orissa. The N. Circars; the Carnatic; Burma. Ceylon, dry low country.

* A wâl = 4 to 6 grains (Jeweller's weight in Western India.) It is the scarlet seed of *Adenanthera pavonina*, Linn.

A moderate-sized tree, with thick longitudinally cracked bark. Wood light red, moderately hard. Branchlets and inflorescence densely clothed, with fine ferruginous or tawny stellate hairs. Leaves distichous, 2-4 in., from a rounded base ovate-oblong, acuminate, often irregularly lobed in the upper part, upperside glabrous, underside white or yellowish, filled with fine stellate hairs. Flowers yellowish-white, sweet-scented, peduncles short, axillary, sometimes bearing 2-3 flowers; bracteoles, deciduous, linear. Sepals linear, fleshy, brown tomentose 4-5 in. long, $\frac{1}{3}$ - $\frac{1}{2}$ in. broad. Petals a little larger than the sepals, but brown and thinner, white. Capsule 2-3 in. long, $\frac{3}{4}$ in. diam., attenuate into a stalk $\frac{1}{2}$ - $\frac{3}{4}$ in. long, tapering at apex to a point, brown velvety. Seeds winged, numerous.

Use:—The flower made into a paste with *kanjika* (rice vinegar) forms an application for hemicrania (Dutt).

In the Concan, the flowers and bark of this, and *P. acerifolium*, are charred and mixed with kamala and applied in suppurating small-pox. (Dymock.) The sweet scent of the flowers is due to the small glands on the outer side of the thickened sepals. The sepals are much used by the Bombay High-class ladies in their hair on account of the lasting fragrance of the glands. (K. R. K.)

183. *P. acerifolium*, Willd., H.F.B.I., I. 368, Roxb. 158.

Sansk:—Karnikara.

Vern.:—Kanak-champa, kaniar, katha-champa (H.); Machkunda (Santal); Laidar (Michi.); Karni-kara, kanak-champa (Bomb.); Matsa kanda (Tel.); Toungetwun, tha-majam weiso (Burm.).

Habitat:—From the N. W. Himalaya in Kumaon, to Chittagong and Concan.

A tall evergreen tree. "Bark thin grey, smooth. Sapwood white; heartwood soft to moderately hard, red. Pores scanty, small oval or elongated, generally sub-divided, visible on a longitudinal section. Medullary rays fine, very numerous, undulating, not prominent, uniform, equidistant. Innumerable very fine concentric lines (Gamble). Leaves obovate, polymor-

phous, cordate or peltate, coarsely-toothed, palmately nerved, glabrous above, white tomentose beneath; blade 10-40 in. by 6-12 in.; petioles 5 in. long, stout. Flowers axillary, very large, and fragrant. Sepals linear brown tomentose without, paler within, 6 by 5 in. Petals white, shorter than the sepals. Stamens club-shaped, stouter and longer than the filamented anthers. Staminal column glabrous, 1-5 in. long, filaments slender. Gynophore longer than the staminal-column. Ovary 5-angled, densely brown-tomentose; style long, stout with a club-shaped stigma; ovarian cells many-ovuled. Capsule 4-6 in. long, 5 angled; 5-celled. Seeds numerous, winged; albumen mucilaginous, scanty; cotyledons thin, folded. (Talbot. P. 149, Vol. I, Forest Flora, Bombay Presidency and Sind, 1909).

Parts used :—The leaves, bark, and flowers.

Uses :—The down on the leaves is used to stop bleeding in wounds (Gamble). The flowers are used as a general tonic (T. N. Mukerji).

184. *Pentapetes phænicea*, Linn. H.F.B.I., I. 371., Roxb. 157.

San. :—Raktaka, Baudhuka, bandhujiva, arka-vallabha, pushpa rakta.

Vern. :—Kat-lálá, Doopahuria (B.); Guldu. Paria (Pb.) Bare baha (Santal); Tâmbdi dupâri (Mar.); Nág-pu (Tam.); Dopahariya, dopohoria (H.); Bare baha (Santal);

Habitat :—Throughout the hotter parts of India.

Annual herbs, branched, 2-5 ft., glabrous, or with a few scattered stellate hairs. Leaves 3-5 in., 1-nerved, crenate-seriate, petiole 1 in. Stipules subulate. Peduncle simple, axillary, as long as or longer than the petiole, 1-2-flowered, jointed near the flower. Bracteoles half the length of the Calyx. Flowers red, opening at noon and closing at the following dawn. Hence in Bombay it is called Dupâri or Madhuk. (See A collection of Marâthi Poems, Navanita, page 406, 4th edition, Bombay). Sepals 5, stellate-hairy, with a few bristles, lanceolate. Petals 5,

obovate. Stamens 20, connate at the base, 15 fertile in groups of 5 each, alternating with 5 staminodes, which are nearly as long as the petals. Anthers 2-celled, extrorse; style entire, twisted; Stigmas 5. Capsule subglobose, bristly, half the length of the persistent Calyx, 5-valved, dividing longitudinally. Seeds 8-12, 2-serrate in each cell; not winged. Cotyledons plaited, 2-partite.

Parts used :—The fruit and root.

Uses :—The fruit is officinal on account of its mucilaginous properties. The root is employed as a medicine by the Santals (Revd. A. Campbell).

185. *Eriolæna quinquelocularis*, Wight.
H.F.B., I. 371.

Vern :—Bhâwât (Chutia Nagpur).

Habitat :—Behar; Western Peninsula, chiefly on the west side, from Bombay southwards; Chutia Nagpur; Nilghiri Mts. Belgaum Ghâts (S. Mahratta country), Coimbatore.

A tree, herbaceous portions stellate hairy. Leaves roundish, toothed, apex acute, shortly acuminate, base cordate, $2\frac{1}{2}$ -3 in., each way, palmately-7-nerved, thinly stellately hairy or glabrescent above, whitish and softly pubescent beneath. Petioles 2 in. Bracteoles a little distant from the flower, minute, caducous, entire or lobed. Cymes at end of branches; peduncles longer than the leaves; stellate-hairy. Pedicels shorter than the flower, jointed above the middle. Flower-buds ovate, oblong. Sepals $\frac{3}{4}$ in. Petals equalling sepals; claw broad, pubescent. Column as long as the petals. Stigma revolute, 5-10-lobed. Style hairy. Capsule $1\frac{1}{4}$ in., oblong, pointed, 5-10-valved; valves not tubercled, usually villous at the angles. Seeds numerous. Flowers in July and August.

Use :—Poultice of root heals wounds (J. J. Wood's Plants of Chutia Nagpur, p. 85).

186. *Abroma augusta*, Linn., H.F.B.I., I. 375, Roxb. 510.

Syn.:—*A. fastuosum*, Gaertn.

Vern.:—Ulatkambal (B.); Olatkambol (Bomb.)

Habitat:—Throughout the hotter parts of India, from the N. W. Provinces to Sikkim, Khasia Mountains, and Assam. Unknown in the Western Peninsula of India.

A small tree native or cultivated throughout the hotter parts of India. Branches and branchlets downy. The bark yields a beautiful silky fibre like that of hemp, and the shrub has often been recommended for growth as a crop. Wood light brown, soft. Pores moderate-sized, subdivided usually into 2 or 3 partitions. Medullary rays very short, brown, and very fine, bent round the pores whose diameter is greater than the distance between them" (Gamble). Leaves 4-6 by 4-5 in., repand, denticulate, ovate from a cordate base, often lobed or angled; basal nerves 5-7, upper smaller, narrower, entire, glabrescent above, soft-pubescent below. Petiole $\frac{1}{2}$ -lin. Stipules linear, deciduous, as long as petiole. Inflorescence soft-pubescent. Peduncles "extra axillary" (Brandis), with two or three purple bisexual flowers. Flowers 2 in. diam. Sepals lin., persistent, lanceolate, free nearly to the base. Petals covered in bud, deciduous; claw concave. Staminal-tube short, 4-petaloid. Staminodes alternating with sessile anthers. Capsule $1\frac{1}{2}$ in., obpyramidal, ultimately glabrous, thrice as long as the persistent Calyx, membranous, 5-angled, 5-winged.

Parts used:—The root, bark and leaves.

Uses:—The root-bark has been brought to notice as an emmenagogue by Mr. B. M. Sircar, in the *Indian Medical Gazette*, for 1872. In the I. M. G. for May 1900, he wrote:—"Forty years ago I first came to know the medicinal properties of this indigenous plant as a good emmenagogue in menstrual disorders. . . . The officinal part of the plant is the fresh viscid sap, which abounds in the thick, easily separable bark of the root and is insoluble in water.

" . . . I have generally used the medicine during the period of the menses, commencing from two days before its appearance (when the pain precedes the flow) three days during the flow and two days after its cessation. In case of no premonitory pains, the medicine is given from the first day of the flow for seven days successively with equally good results.

' A single administration during the menses generally cures the disease and brings on conception in young married women. . . .

" Attempts have been made to administer the drug in the more acceptable forms of tincture, pill or powder, but none prove so efficacious as the fresh viscid sap in substance, in which form I have used it with wonderful results.

" Menstrual disorders, and notably the varieties of dysmenorrhœa, are very prevalent in this country, and it seems nature has supplied it with a simple efficacious medicine by endowing the roots of an indigenous plant with such singular virtues. It is noteworthy that the roots branch out in numerous tender offshoots, superficially under the ground, and can be easily taken out in abundance."

Dr. J. H. Thornton considers that it is useful in the congestive and neuralgic varieties of dysmenorrhœa, and that it regulates the menstrual flow and acts as an uterine tonic. It should be given during menstruation, with black pepper. The dose is said to be half a drachm of the fresh viscid juice of the root-bark (Am. Journ. Med. Sci., p. 276, 1873).

The infusion of fresh leaves and stems in cold-water is demulcent, and very efficacious in gonorrhœa (Surgeon Meadows, in Watt's Dictionary.)

187. *Guazuma tomentosa*, Kunth, H.F.B.I., I. 375.

Vern. :—Nipal tunth (Beng.) Of the bark :—Bandoq-ke-jhâr-ki chhal (Dec.); Tain-pûchli-pattai (Tam.); Udrik-patta (Tel.); Rudrakshi (Kan.).

Habitat:—Generally distributed, and frequently cultivated in the warmer parts of India and Ceylon.

A small tree, a native of Tropical America, but frequently cultivated in the warmer parts of India and Ceylon. Bark brown rough. Wood white or yellowish or light brown, soft, even-grained. Annual rings faintly marked. Pores moderate-sized, fairly numerous, often subdivided. Meduallary rays moderately broad to broad, not numerous, conspicuous in the silver-grain on a radical section. The tree is easily grown and propagated, "planted or run wild," adds Gamble. Herbaceous portions tomentose. Leaves from an unequal-sided base, obliquely cordate, ovate-oblong or lanceolate, acuminate, serrate, scabrid or glabrescent above, pubescent beneath; base 5-7-nerved; petiole short. Flowers numerous, small, yellow and purple in terminal and axillary panicles, which are twice the length of the leaves; or in multifid cymes. Flower-buds globose. Calyx 1½ in. bell-shaped, stellate-hairy; sepals ultimately reflexed; petals exceeding the Calyx, claw concave. 5 Petaloid Staminodes alternating with 5 filaments each, bearing several anthers. Anthers concealed in the hood of the petals. Capsule 5-valved, lin. long, oblong obtuse, or ovoid, woody, with obtuse black tubercles, resembling a mulberry.

Part used:—The bark.

Use:—In Martinique, the infusion of the old bark is esteemed as a sudorific, and as useful in cutaneous diseases and diseases of the chest (Lindley.)

The bark is tonic and demulcent, and is used with benefit in some of those cases in which calumba and gentian are indicated (Moodeen Sheriff.)

The inner bark is esteemed as a remedy for elephantiasis in West Indies (Watt.)

N. O. TILIACEÆ.

188. *Grewia tiliæfolia*, Vahl. H.F.B.I., I. 386, Roxb. 431.

Sans.:—Dharmana, Dhanurvriksha; Dhanvan.

Vern. :—Phársá dhâmani (H. and B.) ; Dhâman Karkani (Bomb.) ; Olat (Santal.) ; Khesla, kasul (Gond.) ; Thada, tharra (Tam.) ; Charachi, tharrah, Udúpai, tada (Tel.) ; Thadsal, dadsal, batala, bútále (Kan.)

Habitat :—Hot dry forests throughout Western India, ascending 4,000 feet in the Himalaya. Western Peninsula, Burma, Ceylon low country.

A large deciduous tree, with cinereous exfoliating bark. Leaves ovate, sometimes rhomboidal or 3-lobed, obliquely cordate, acute or obtuse, acuminate at apex, bluntly crenate-serrate, sparsely stellate-pubescent or glabrous above, stellate-tomentose, often white beneath, stellate-pubescent on the nerves; basal nerves 5; blade 2-5½ in. by 1-4 in., petiole ½-1 in. long; stipules ½ in. long, leafy falcate, veined and auricled, deciduous. Flowers small, in axillary umbels; peduncles ¼-1 in. long, axillary, 3-8 fascicled, 3-flowered; pedicels shorter than the peduncles; buds ovoid, grey-tomentose, 5-ribbed; bracteoles linear-lanceolate. Sepals linear-ovate, ½ in. long, glabrous, white tomentose outside and yellowish within. Petals ovate, emarginate, yellow, turning purple, much shorter than the sepals; basal gland green and densely white-villous on the margins and often more than ½ the length of the petal. Torus short-ribbed, glabrous, obscurely-toothed and hairy at top. Stamens, with purple filaments and yellow anthers. Ovary globose, villous; style longer than the stamens; stigma peltate, irregularly 5-lobed. Drupe 2-4 lobed, but not deeply, of the size of a pea, black; lobes several-seeded.

The fruit is said to be eaten (Trimen).

Parts used :—The bark and wood.

Uses :—In the Konkan the bark, after removal of the tuber, is rubbed down with water, and the thick mucilage strained from it and given in 5-tola doses, with 2 tolas of the flour of *Panicum miliaceum* (warri) as a remedy for dysentery (Dymock).

The bark is also employed externally to remove the irritation from cow-itch.

Colonel Cox says that the wood reduced to a powder acts as an emetic, and is employed by the natives as an antidote to opium poisoning.

189. *G. asiatica*, Linn. H.F.B.I., I. 386., Roxb. 431.

Sans. :—Purusha.

Vern. :—Phálsā, shakri (B. and H.) ; Phalna, pharnu (Pb.) ; Phutiki (Tel.) ; Singhindamin (Kol.) ; Jangolat (Santal) ; Tádáchi (Tam.) ; Pastaoni, shikarim-ai-wah (Pushtu) ; Phárahó, phalsa (Sind).

Habitat :—Cultivated in India, except in the Gangetic plains and East Bengal, and said to be indigenous in the Salt Range, Poonch and Oudh, Ceylon.

N.B.—Kanjilal's Syn. of this plant is *G. Asiatica* Var. *vestita*, Wall, (See p. 65. For. Fl. Sch. Circ., N. W. P., 3rd Ed. 1911, Calcutta).

The following is Kanjilal's description :—"A tree with grey bark ; branches and young plants with large white blotches. Leaves 3-5 by 2-2½ in., obliquely ovate, generally not cordate, acuminate, minutely serrate, sometimes obscurely 3-lobed, pale and softly downy beneath, especially when young ; basal nerves 5-6 ; petiole generally not exceeding ½ in. ; stipules linear. Flowers in densely crowded (rarely solitary) axillary cymes ; peduncles ½-¾ in. long, not ribbed. Sepals slightly pubescent, and yellow inside. Petals yellow, much shorter than the sepals. Drupe globose, ½-¾ in. diam., sometimes indistinctly 2-4-lobed, dark brown, or black when ripe."

Kanjilal further remarks :—On comparing a number of specimens collected by me, Mr. Duthie was satisfied that *G. elastica*, Royle, was quite distinct from *G. vestita*, Wall., on the grounds that in the former the innovations were dark rusty-tomentose, the petals not glandular at the base, and the leaves very frequently lobed. (p. 66 of *cit.*) Wood grey, tough, elastic, hard and close-grained. The bark yields white fibre. Fruit edible.

Parts used :—The fruit, leaves, bark and root.

Uses:—The fruit is supposed to possess astringent, cooling and stomachic properties; from it a spirit is distilled and a pleasant sherbet. The leaves are used as an application to pustular eruptions, and the buds are also prescribed by native practitioners. An infusion of the bark is used as a demulcent. (Dr. Stewart).

The Santals use the root-bark for rheumatism (Revd. A. Campbell).

190. *G. scabrophylla*, Lamk. H.F.B.I., I. 387., Roxb. 430.

Vern.:—Pándhari dháman, khatkhati (Mar.); Darsuk (Kan.).

Habitat:—Tropical Himalaya, Garwhal, Sikkim, Mysore, from Gujrat straight to Behar, Sub-Himalaya tract and outer valley, from the Jumna eastward, Oudh forests, Northern Circars, Assam, Pegu, Upper Burma (Ava), Chittagong; common in Dun and Saharanpur forests (Kanjilal).

A shrub; branchlets, underside of leaves and inflorescence clothed with soft, tawny tomentum. Leaves 3-6 by 4 in., often slightly lobed, base 3-5-nerved, secondary nerves not arched, scabrous above, pubescent beneath, roundish ovate, irregularly serrate. Brandis says the leaves are 4-9 in. long, ovate or obovate, tertiary nerves distinct beneath. Petiole $\frac{1}{2}$ in.; peduncles short, 1-4 in., axillary; stipule subulate. Flowers large, 2-3 on each peduncle, $\frac{3}{4}$ in. Blade of petals white, ovate, larger than often twice the length of the claw.

Cymes umbellate, says Maxovell T. Masters (Hook.); pedicels diverging, longer than the peduncles. Bracteoles linear-subulate, deciduous. Flower-buds obovate-oblong, ribbed. Sepals linear-lanceolate, pubescent; Petals notched, half the length of the sepals, or less. Gynophore glabrous, edge villous, 5, small tufts of hair at base, between petals. Fruit a globose drupe, not lobed, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., rind brown, crustaceous, hairy; stones 4, 1-2-seeded, in sweet, yellowish viscid pulp.

Parts used:—The leaves and root.

Uses:—It is given in accordance with the “*doctrine of signatures*” as a remedy for leprosy in the Concan; it appears to be simply mucilaginous like most of the gums. (Dymock)

Its roots are used by the Goanese as the substitute of *Althæa*.

191. *G. villosa*, Willd. H.F.B.I., I. 388.

Vern:—Gaphni (Kol); Tarse kotap (Santal); Jalidar kaskusri, thamther (Pb.); In zarra, pastuwanne (Pushtu; Dhoban (Ajmer). Kharmati (Mar). Pâde Khado (Gujrat and Porebunder); Luskanû jhâd (Cutch).

Habitat:—Western and Southern India, extending from Panjab and Sind to Travancore. Gujrat, Porebunder, Kutch.

A shrub often gregarious. Branches, leaves and inflorescence densely silky, with long stellate hairs. Leaves not hoary beneath, nearly orbicular, from a cordate base; 1-4 in. diam., rugose, transverse veins numerous, prominent and parallel, tufts of silky hairs in the serratures. Secondary nerves not arched. Petiole $\frac{1}{2}$ -1 in. Base of leaves 5-nerved. Stipules broad, leafy. Flowers dull-yellow, peduncles very short, in compact axillary clusters, sometimes opposite the leaves. Bracts oblong. Sepals oblong or linear-acute, villous, membranous, $\frac{1}{2}$ in. long, clothed on both sides with short stellate hairs, outside also with simple hairs, the tips often with a long-branched and stellate process. Blade of petal thin, twice the length of a claw, oblong, notched, much shorter than the sepals. Fruit globose, size of cherry, with a distinct crustaceous brown rind, with tufts of long stellate hairs; pulp pleasant. Stones 4, 1-2-seeded.

The sweet acid fruit is used as dessert by the poor of Porebunder. The juice of fresh bark is used with sugar and water for gonorrhœa and urinary complaints attended with irritability of the bladder.

Part used:—The root.

Use:—The root is employed for diarrhœa in Chutia Nagpur (Revd. A. Campbell.)

912 *G. polygama*, Roxb. H.F.B.I., I. 398., Roxb. 431.

Syn. :—*G. lancifolia*, Graham, Cat Bombay Plants 21.

Vern. :—Kukur bicha (H.) ; Seta kata, seta andir (Santal) ; Gowli or gowali (Bomb.)

Habitat :—North-Western India, and along the Himalaya, from the Salt Range to Nepal, also Concan. Dry country, Ceylon.

A shrubby plant or small tree. Branches bifarious, spreading ; branchlets, petioles, under side of leaves velvety. Leaves almost sessile, narrow beneath, distichous 3-4 by $\frac{1}{2}$ - $\frac{3}{4}$ in., lanceolate, very acute serrate, base 3-nerved, nerves not arched, secondary nerves transverse, parallel. Stipules subulate. Peduncles 1-5, short, axillary, slender, generally fasciculate, about half the length of the leaves ; pedicles 2-3, divergent, shorter than the peduncle. Male flower :—Sepals $\frac{1}{6}$ - $\frac{1}{4}$ in. diam., linear, longer than the oblong entire petals, $\frac{1}{8}$ in., blade equal to claw which is hairy on back. Stamens as a rule 10-12, but sometimes more numerous. Hermaphrodite Fl. :—Ovary very hairy, stigma 5-lobed, lobes spreading, deeply cut into numerous segments. Drupe $\frac{1}{2}$ in. diam ; hairy, brownish, more or less 2-lobed. Stones 4, 1-seeded.

Use :—This plant is used by the aborigines of North-Western Australia as a remedy for dysentery. Dr. W. E. Armit states that on one occasion, having had to treat dysentery following on fever and ague, this plant was pointed out to him by a native as a sure remedy. He collected a quantity of leaves, and having made a pale sherry-coloured decoction of the leaves, he administered about two tablepoonsful for a dose. Repeating this every four hours throughout the night, the sixth dose made a complete cure. "Since then," says Mr. Armit, "I have tried this remedy in scores of cases, and I have never known it to fail in any case, however serious. I have made it a rule to inform the carriers and travellers, I meet, of the sure cure they have always at hand in case it may be required, and all are unanimous in extolling its truly magical

properties." (Christy's New Commercial Plants, No. 7, p. 50.—1884).

The fruit is employed as a medicine by the Santals, in diarrhoea and dysentery. The root pounded is also prescribed for the same diseases, and powdered in water is applied externally to hasten suppuration, and as a dressing for wounds. The paste dries and forms a hard coating, thus effectually excluding air from the raw surface (Revd. A. Campbell.)

193. *Triumfetta rhomboidea*, Jacquin, H.F.B.I., I. 395. Roxb., 390 and 391.

Sansk:—Jhinjharitā (J. Indrajī).

Vern.:—Chitki, Chiriyāri (H.); Bun-okra (B.); Aodaiotti (Tam.) Nichārdi (Bomb.). Jhinjudi; Nichārdi (Marāthi).

Habitat:—Throughout tropical and sub-tropical India, and Ceylon, a very common weed. It grows wild and freely on Matheran Hill.—K. R. Kirtikar.

An annual or perennial herb, $1\frac{1}{2}$ -3 ft., slightly branched; branches pubescent, with simple hairs. Leaves $1-2\frac{1}{2}$ in., variable, the lower more or less deeply 3-fid., the upper ovate-lanceolate, all coarsely and irregularly serrate, simply hairy on both sides; often tomentose and white beneath. Petiole of lower leaves long, of upper leaves very short. Flowers small, $\frac{3}{8}$ in. diam., yellow, on short pedicels, clusters crowded into a spicate inflorescence at end of branches, buds oblong, slightly stellate-pubescent; petals equalling sepals. Stamens 8-15. Fruit very small, globose, $\frac{1}{8}$ in., finely tomentose, spines less than $\frac{1}{8}$ in., glabrous, hooked, cells 3-4.

Parts used:—The fruit, flowers and leaves.

Uses:—The mucilaginous and astringent properties of the leaves and fruits of certain *Triumfettas*, called *Carapixo de Calçada* in Brazil, which grow everywhere in that country, especially on the roadside, and in the vicinity of dwellings, render them serviceable in injections for inveterate gonorrhoea.

(Murray.) The bark and fresh leaves for diarrhoea; also flowers rubbed with sugar and water are given in gonorrhoea by the villagers of Porebunder to stop the burning caused by urine (J. Indrajī.)

All the species of this genus are mucilaginous, and are used as demulcents, but this is the one generally so employed
* * The burr-like fruit is believed in India to promote parturition (Dymock.)

194. *Corchorus capsularis*, Linn., H.F.B.I., I. 397. Roxb. 429.

Sans. :—Kāla Sāka.

Vern. :—Harrawa (Shahjahanpur District) Ghinalta pat, Narcha, Chouchen (Bombay); Chhuñeht, Borachhñecht (Gujrat, Porebunder).—J. Indrajī.

Habitat :—Throughout the hotter parts of India. Low-country, Ceylon.

An annual herb. Leaves 2-4 by $\frac{3}{4}$ in., glabrescent, oblong, acuminate, coarsely toothed; base generally prolonged into tail-like appendages; petiole $1\frac{1}{2}$ in. Stipules $\frac{1}{4}$ - $\frac{1}{2}$ in. Flowers yellow, less than half an inch in diameter; pedicillate. Capsule oblate, subglobose, 5-celled, wrinkled, muricate, 5-valved, valves without transverse septa. Seeds few in each cell (Maxwell T. Masters).

Parts used :—The leaf. Dried root and unripe fruit in diarrhoea, in decoction (Indrajī.)

Use :—The dried leaves are used medicinally, being eaten at breakfast-time with rice, in cases of dysentery.

The cold infusion is also administered as a tonic in dysenteric complaints, fever, and dyspepsia (Watt).

195. *C. olitorius*, Linn, H.F.B.I., I. 397. Roxb. 429.

Sans. :—Nādika, patta, sing-giká.

Vern. :—(Gujrat and Porebunder) Chhñunchdo. Moti Chhñunch; Mahā Chanchu. Singhin janascha (H.); Pát, lali-

tapat, kashta, bhungi or banpat (B.) ; Bun-pat (Sind) ; Ban-phal (N.-W. P. and Pb.) ; Peratti-kirai (Tam.) ; Parinta (Tel.) Tánkla, Chunch ; Mothi Chunch (Bombay.)

Habitat :—Indigenous in many parts of India. Low country weed in Ceylon.

An annual herb, more or less covered with stellate pubescence. Leaves 2-4 by 1-2 in., nearly glabrous, ovate-lanceolate, 3-5-nerved, serrate, the two lower serratures prolonged into a long sharp point ; petiole 1-2 in., pilose. Stipules shorter than the petioles. Peduncles 1-3-flowered ; shorter than the petiole. Sepals small, shortly-pointed. Petals yellow, spatulate, longer than the sepals. Fruit a capsule 2 in. long, cylindric, glabrous, 10-ribbed, "10-12-times longer than broad." (Arnold). Beak entire. Valves with transverse partitions between the seeds, beak long, erect. Cultivated as a potherb, or for its fibre (Jute). The very soft pithy wood is used for county-made sulphur-tipped matches.

Parts used :—The leaves, seeds.

Uses :—The leaves and tender shoots are eaten, and in the dried state, known as *nalita* ; they are used in infusion by the natives as a domestic medicine, being tonic and slightly febrifuge, and hence used as a fever drink (Watt.) According to Ainslie, the Hindoos reduce the plant to ashes and mix it with honey for administration in obstructions of the abdominal viscera.

Twining speaks favorably of an infusion of the leaves as a useful fever drink.

Mr. Atkinson says :—The leaves are emollient, and used in infusion as refrigerant in fevers and special diseases. The dried plant roasted and powdered, is used in visceral obstructions.

Dr. Kanay Lall Dey says :—The dried leaves are sold in the market. A cold infusion is used as a bitter tonic, and is devoid of any stimulating property. It can be safely given to patients recovering from acute dysentery to restore the appetite, and improve the strength. Six grains of the powder, combined with an equal quantity of curcuma longa,

has been used in several instances, with much success, in acute dysentery.

In South India, the dried plant is used as a demulcent. (Bidie.)

Powder of leaves given in dysentery 5-10 grs., with an equal part of powdered turmeric. Powdered seeds with honey and ginger given in diarrhœa (Vaidya Rugnathji)—J. Indrajī.

The leaves are demulcent, tonic and diuretic, useful in some cases of chronic cystitis, gonorrhœa and dysuria. (Moodeen Sheriff.)

196. *C. trilocularis*, Linn., H.F.B.I., I. 397, Roxb. Fl. Ind. II. 582.

Sans. :—Kaunti.

Vern. :—Kadu Chunch (Bomb.); The seeds, Rāja-jiren (Bomb.); Isbund (Sind); Tandassir (Kan.)

Habitat :—Sind, North-Western Provinces, from Umballa to the Punjab, Nilghiri Mountains.

An annual herb. Leaves 1-4 by 1 in. Elliptic-oblong or oblong-lanceolate, crenate-serrate, with or without basal sharp-pointed lobes; petiole very short, pilose. Peduncles 1-3-flowered, very short, opposite the leaves. Flowers small, yellow. Capsule elongated, 3-angled; scabrous or aculeate, straight or curved. 3-4-angled, 3-4-valved, valves scabrous, with transverse partitions, beak short, erect.

It would appear that the three varieties mentioned by Wight and Arnold (Prod. I. 72) are mere individual variations. They are :—(a) leaves ovate-oblong, capsule in pair, 3-angled; (b) leaves ovate-oblong, capsules solitary, 4-angled; (c) leaves oblong-lanceolate, capsules in pairs, 3-angled.

Uses :—The seeds are bitter and administered in doses of about 80 grains in fever and obstruction of the abdominal viscera (Dymock.)

The plant, macerated for a few hours in water, yields a mucilage, prescribed as a demulcent; seeds as a specific in rheumatism (Murray.)

197. *C. fascicularis*, Lam. H.F.B.I., I. 398.
Roxb. 429.

Sans.:—Chunchu, Kshetra Chunchu.

Vern.:—*Hind*—Khetapât, Bankosta—J. Indrajî. Hiran-khori, Mothî Bahuphali, Bomb.); Jangli or ban-pât, bil-nalita (B.); Chhunchhadi, Ubhibahuphali, (Gujrat and Porebunder).

Habitat:—Throughout the hotter parts of India, from Banda to Bengal and the Western Peninsula, Porebunder.

An annual herb, erect, ramous. Leaves oblong or lanceolate, serrated; 1-2 by $\frac{1}{4}$ - $\frac{1}{2}$ in.; petioles very short, pilose. Peduncles 3-5-flowered, opposite to the leaves. Flowers yellow, subsessile fascicles, sub-pentandrous. Sepals $\frac{1}{2}$ in. Stamens about 5 (W. and A.). "5-10" says Max-well T. Masters (H. F. B. I.). Capsules linear-oblong, or cylindric, 4-6 times longer than broad, nearly terete, villous, rostrate, with three terminal points, 3-celled, 3-valved. Seeds numerous; transverse septa nearly obsolete.

Use:—It is very mucilaginous and somewhat astringent, and is valued as a restorative (Dymock.)

In Bombay, a watery extract, mixed with sugar-candy, is taken as a nutritive tonic. It is also given in seminal weakness (S. Arjun), but with doubtful success—K. K. Kirtikar.

198. *C. antichorus*, Raesch, H.F.B.I., I. 398.

Vern.:—Bahuphalli, kúrand, bophalli, bahúphalli, babuna (Pb.); Moodheeree (Sind); Baphuli (H.) (J. Indrajî):—(Porebunder and Gujrat) Chhikni, Chhunchh; Bethi-Bahuphali; Bahuphali. (Maráthi) Bahuphali.

Habitat:—North-West India, from Sindh and the Punjab to Agra, Western Peninsula, in Kathiawar, Guzerat and the Deccan.

A perennial herb, woody 6-9 in., prostrate, much-branched from the base; branches prostrate, tortuous, imbricate 6-7 in. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ by $\frac{1}{4}$ - $\frac{1}{2}$ in., roundish, usually wrinkled, plicate, crenate-serrate, glabrous, the serratures not appendaged, base rounded or cuneate; 3-nerved. Petioles $\frac{1}{2}$ -1 in. long, very

slender; stipules subulate. Cymes leaf-opposed. Peduncles short, stout; bracts lanceolate, subulate; pedicels very short. Sepals $\frac{1}{16}$ in. long, linear-oblong, apiculate. Petals longer than the sepals; oblong-ovate. Capsules $\frac{3}{8}$ - $\frac{5}{8}$ in. long, cylindric, elongate, beaked, glabrous, often curved upwards, generally straight, 4-valved.

Part used:—The whole plant.

Uses.—The plant is rubbed down and given as a cooling medicine. Leaves are emollient. The plant has tonic properties as a whole.

Infusion used as a fever drink (Stewart.)

Very mucilaginous, mucilage demulcent, and used in Sindh for gonorrhœa (Murray). A decoction of seeds with milk and sugar as a tonic. Dose of powdered plant $\frac{1}{2}$ —1 tola.

The seeds of *Corchorus fascicularis* are mucilaginous, sweet, non-toxic, and edible; those of *C. Olitorius*, are purgative; those of *C. Capsularis*, *C. bengalensis*, *C. acutangulus*, *C. argutus* and *C. trilocularis* contain fat; and the last three, besides a green fluorescent body, a toxic glucoside, the corchorin of Tunno and W. Friboes. Corchorin is intensely bitter, readily soluble in water and in alcohol, but insoluble in ether, chloroform, and benzene, so that it cannot be isolated by shaking out with the last-named liquids. It is very slightly precipitated by neutral lead acetate, but is thrown down by ammoniacal lead acetate. It gives a bluish green colour with strong sulphuric acid. It is removed from strong aqueous solutions by means of ammonium sulphate. Corchorin is hydrolysed by boiling with dilute mineral acids, forming a sugar and a decomposition product, which is insoluble in neutral and acid aqueous solvents but soluble in alcohol. It is very poisonous, being allied to the digitalis glucosides.

(J. Ch-I. 30. 4. 1907 pp. 430-431).

N. O. LINEÆ.

199. *Linum usitatissimum*, Linn. H.F.B.I.,
I. 410. Roxb. 277.

Sans.:—Atasi, Masrinâ.

Vern.:—Alsi, tisi (H.); Tisi masinâ (B.); Alsi-virai (Tam)
Atasi (Tel.); Pesu (Uriya); Alasi (Porebundar and Gujrat):
Javas; (Marathi) Alashi.

Habitat:—Cultivated throughout India, Ceylon, Western Himalayas.

An annual herb. Stem cylindric erect, simple below ; 2-4 ft., often solitary, corymbosely branched above. Leaves narrow, linear or lanceolate, sub-3-nerved, without stipular glands. Flowers lin. diam., in broad cymes ; sepals 5, ovate-acuminate, 3-nerved, glandular, margins ciliate or not. Petals 5, crenate, contorted, fugacious, blue ; style, quite free ; stigmas linear-clavate. Carpels with ciliated axile margins in the Indian plant, 5-celled ; cells 2-locellate, 2-ovuled. Capsule scarcely exceeding the narrowly white-margined sepals, 5-celled, septicidally splitting into 5 simple or 10 1-seeded Cocci. Seeds compressed, albumen sparing ; Embryo straight.

Parts used :--The seeds, oil and flowers.

Uses :—The Mahomedans consider it to be cold and dry, and that clothes made with the fibre, cool the body and lessen perspiration ; they recommend fumigation with the smoke, for colds in the head and hysteria, and use the tinder to staunch hæmorrhages. The flowers are said to be cardiacal, the seeds aphrodisiacal, and hot and dry. Linseed poultice is recommended for gouty and rheumatic swellings ; as an emollient, the mucilage is dropped into the eye ; with honey it is prescribed in coughs and colds. The roasted seeds are said to be astringent (Dymock).

The seeds are used internally for gonorrhœa and irritation of the genito-urinary system. The flowers are considered a cardiac tonic (Emerson).

It is officinal in the Indian and the British Pharmacopœias. Medicinally, it is used for poultices.

The proteins of linseed were extracted with 0.2 per cent. potassium hydroxide solution and hydrolysed with hydrochloric acid of sp. gr. 1.16. They yielded glycine traces ; alanine, 1.03 per cent. ; valine, 12.71 ; leucine and isoleucine, 3.97 ; proline, 2.85 ; phenylalanine, 4.14 ; aspartic acid, 1.65 ; glutamic acid, 11.58 ; serine, traces ; threonine, 0.65 ; arginine, 6.06 ; histidine, 1.66 ; lysine, 1.19 ; ammonia 1.94 ; and tryptophane, traces—in all amounting to 49.43 per cent. The chief feature of the hydrolysis is the very high proportion of valine, 12.7 per cent., as most proteins yield less than 1 per cent. of valine. The amount of tyrosine is exceptionally low and the accuracy of the methods of separating this amino-acid is open to doubt. Basic lead acetate precipitates from neutral or faintly alkaline solutions containing

tryosine, an insoluble basic salt, $2\text{Pb}(\text{C}_9\text{H}_{10}\text{O}_3\text{N})_2 \cdot 5\text{Pb}(\text{OH})_2$. This separates in a granular state and is readily filtered and washed. J. Ch. I. for Feb., 15, 1911 p. 148.

"My experience has been that Bombay oils usually give the highest iodine value, but that these vary from year to year with the crop and season."

Oil.	Iodine value.	Sp. gr. at 15°.	Hexabromides.		M. pt.
			1	2	
Calcutta oil	185	0.9322	39.1	39.3	140—5°C.

Dr. Harry Ingle in the J. Ch. I. for March 31, 1911 p. 344.

200. *Reinwardtia trigyna*, Planch, H.F.B.I., 1. 412.

Syn. :—*Linum trigynum*, Roxb. 277.

Vern. :—Karkún, kuar, gud batal, basant, bál-basant, gulashruf (Pb.) Abai (Deccan).

Habitat :—Hilly parts of India, Simla. From the Panjab to Sikkim. Behar, Assam, Chittagong. Southward from the Bombay Ghats to the Nilgiri Hills. Very common in the Dun, and the Hills around.

A tufted glabrous shrub, 2-3ft. high, with erect and prostrate rooting; terete, rather stout, soft branches; leaves entire, ovate-lanceolate, 2-4in., narrowed into a slender stalk; tip obtuse or acute, minutely mucronate, lower surface pale. Flowers about lin. dia., axillary, solitary or in small clusters, sometimes combined in a terminal corymb. Sepals 5, lanceolate, acute, green. Petals primrose-yellow, much longer than the calyx, obovate. Stamens usually in 2 sets, 3 long, 2 short. Ovary 5-celled. Styles usually 3, sometimes 4-7, longer or shorter than the stamens, more or less united, rarely free. Capsule size of a pea; papery (Kanjilal), globose $\frac{1}{4}$ in. diam.; separating into as many valves as there are styles. See Darwin's *Forms of Flowers*, Chap. VII.

Use :—Said to be used as a medicine for cattle (Dr. Stewart).

201. *Hugonia Mystax*, Linn., H.F.B.I., I. 413.

Vern.:—Agúre (Tam.); gatrinta; tivoa potike; vendapa; Káki bira (Tel.); Modera Canni (Mal.)

Trimen gives the following names:—

Sinhalese:—Maha-getiya, Bugetuya;

Tamil:—Motirakanni.

Habitat:—Western Peninsula, from the Concan to Travancor. Ceylon, low country.

In the Konkan, near the sea-coast, at Vingorla; Northern Circars and the Karnatic; Ceylon (Trimen, Fl. Ceylon, I. 189.)

A climbing shrub, scrambling; branches spreading, set with numerous short, stiff, yellow-tomentose branchlets. "Bark yellowish-white, corky. Wood greyish-white, hard, close-grained. Pores small, very numerous and evenly distributed. Medullary rays very faintly marked, numerous, regular." (Gamble). Branches leafless below, bearing in the axils of the lowest leaves a pair of woody, reflexed, circinate, tomentose pines (modified peduncles occasionally bearing flowers), above them tufts of leaves and axillary flowers. (Brandis). Leaves alternate, stipules subulate. Flowers yellow, 1 in. across. Sepals 5, unequal, imbricate. Petals 5, contorted. Stamens 10; filaments connate at base. Ovary 5-celled, styles 5, distinct. Drupe red or yellow, $\frac{1}{2}$ in. long, endocarp bony, grooved; Seeds 2-3 (Brandis). Flowering time, May-October.

Uses:—The bruised roots are employed externally in reducing inflammatory swellings, and as an antidote to snake-bites. In the form of a powder, it is administered internally as an anthelmintic and febrifuge. The bark of the root is also employed as an antidote to poisons (Watt).

202. *Erythroxylon monogynum*, Roxb. H.F.B.I., I. 414. Roxb. 322.

Syn.:—*E. indicum*, Bedd Fl. Sylv. p. 81. *Sethia Indica* D.C.

Vern.; Nát-ká-devdār (Dec.); Devdarum, Chemmanally (Tam.); Adivi geranta, pagadapu-katta (Tel.)

Habitat :—Hilly parts of the Western Peninsula ; Ceylon, dry country.

A shrub or small tree. "Bark dark brown, thick, rough. Wood very hard. Sapwood white ; heartwood dark reddish-brown, with a pleasant resinous smell ; takes a beautiful polish. Pores very small, very numerous, often in radial strings or patches in lighter tissue. Medullary rays short, very fine, uniformly distributed" (Gamble). Leaves cuneate, 1-2 in. long, dull, not shining, glaucous-brown beneath, when dry ; stipules triangular, long, acuminate. Pedicels about as long as the petiole. Flowers greenish-white, axillary generally in fascicles of 1-4, bisexual, pentamerous. Calyx 5-lobed. Petals with a scale, generally bifid at the top of the claw. Stamens 10. Styles 3, combined nearly at the apex, longer than the stamens. Stigmas clavate. Drupe oblong, triangular, 3-celled, 2 of the cells long, abortive ; apiculate, bright scarlet when ripe, supported by the persistent sepals and stamens.

Parts used :—The leaves, wood and bark.

Uses :—Dr. Bidie says that "during the Madras famine the leaves were largely eaten by the starving poor, and as there is nothing in them structurally likely to satisfy the pangs of hunger, it seems probable that they contain some principle like that of *E. Cocoa*."

Subsequently, the leaves were examined by Dr. Waddel, Officiating Professor of Chemistry, Calcutta Medical College, for alkaloid, but he could not discover any. (*Vide* I.M.G., September 1884.)

According to Dr. Moodeen Sheriff, an infusion of the wood and bark is stomachic, diaphoretic and stimulant diuretic ; useful in some slight cases of dyspepsia and continued fever, and also in dropsy as an adjuvant to some other and more active medicines. The leaves are refrigerant.

Dr. Bidie mentions the powder as used medicinally as a substitute for sandal wood.

The pulp beaten into a liniment with gingelly oil is used as an external application to the head.

N. O. MALPIGHIACEÆ.

203. *Hiptage Madablota*, Gaertn. H.F.B.I.,
I. 418.

Syn.:—*Gaertnera racemosa*, Roxb. 360.

Sans.:—Mâdhavi, Atimuktâ.

Vern.:—Kampti, madmalti; huthee mookta (H.); Endra, chopar, benkar (Pb.); Madhablata (B.); *Haladuwail*, Madhúmâlati, Mâdhavlatâ, Mâdhavi. (Mar.); Aita-lugala (N. W. P.); Shempati (Nepal); Baromali (Uriya); Mâdhavi tige, vadla yârâla, potuvadla (Tel.)

Trimen.:—(Singhalese) Puwak-gédi.

J. Indrâji.:—(Porebunder and Gujrat) Rakatpiti, Ragatpiti, Madhavi.

Habitat.:—Throughout the hotter parts of India. Ceylon, low country, moist and dry regions.

A large straggling shrub, trunk stout and erect, often of considerable size. Branchlets, young leaves and inflorescence hoary or adpressed-tomentose. Bark brown, thin, exfoliating in small thin flakes. Wood reddish-brown, very rough, soft and moderately hard, with darker patches in the centre (Gamble). Branches stout. Leaves 3-6in., oblong or ovate-lanceolate, acuminate or cordate-acuminate: coriaceous, petioled, shining above. Racemes with densely adpressed pubescence, 1-6in., axillary, usually forming a leafy panicle. Flower $\frac{1}{2}$ -lin. diam., very fragrant, white. Sepals obtuse. Petals twice as long, fimbriate, the 5th petal dashed with yellow at base. Carpels with a central wing between the 2 lateral. Wings of carpels coriaceous, middle one, one or two inches long, linear-oblong or oblanceolate, the two outer or lateral narrower or shorter, spreading half as long. Seeds subglobose. Cotyledons thick, unequal.

Parts used.:—The leaves and bark.

Uses.:—The leaves are esteemed useful in cutaneous diseases (Watt).

The bark is a good sub-aromatic bitter (Graham).

The juice of the leaves is an effectual insecticide and a valuable application in scabies, if rubbed well and frequently over the affected parts (Moodeen Sheriff).

Useful in chronic rheumatism and asthma (Dr. Houston in Watt's Dictionary).

N. O. ZYGOPHYLLÆ.

204. *Tribulus terrestris*, Linn. H.F.B.I.,
I. 423.

Syn. :—*T. lanuginosus*, Linn.

Habitat :—Throughout India; the warmer countries Ceylon. Throughout the globe.

Sans. :—Gokshur, Gokantak, Laghu Gokshur, Ikshugandha.

Vern. :—Gokshri, hussak (H.); Gokhru (B.); Trikundree (Sind); Bhakhra (Pb.); Kānte Ghokrú (Dec.); Sarāte (M.) Nerunji (Tam.); Palleru-mullu (Tel.) Nerinnil (Mal.); Lahna gokroo (Bomb.)

Vern. Trimen :—(Sinhalese) Sembu-Nerinchī; (Tamil) Chira-nerinchī;

J. Indrajī :—(Porebunder and Guj.) Mithā Gokhru, bethā gokhru, Nahana Gokhru, Gokhru; (Hindi) Chihota Gokhru;

Annual or perennial, with numerous long, prostrate, more or less hairy or hispid branchlets; "herbs hirsute or silky hairy," as Edgeworth and Hooker say. Common in sandy ground. Branches 1-2ft. Leaves opposite. The pair usually unequal; pinnate, with 3-6 pair of opposite, usually sessile leaflets. Leaflets $\frac{1}{4}$ - $\frac{1}{2}$ in., 5-7 pair, subequal, mucronate, oblong, white and silky beneath, slightly silky above. Stipules lanceolate, acute; peduncles shorter than the leaves, slender. Flowers bright yellow, $\frac{1}{4}$ - $\frac{3}{4}$ in. diam., solitary, axillary, or leaf-opposed. Sepals linear, acute. Petals rounded, longer than sepals, fugacious. Ovary bristly; style stout, short. Fruit of (usually) 5, hairy or nearly glabrous, woody cocci, each with 2 pair of stiff sharp spines, forming a more or less spherical, spiny ball.

Of the two pair of spines, one pair is long and one short. The cocci are very variable. Stigmatic lobes larger than the diameter of the styles.

Parts used :—The entire plant, and especially the fruit and leaves.

Uses :—In Hindoo Medicine, the fruits are regarded as cooling, diuretic, tonic and aphrodisiac, and are used in painful micturition, calculous affections, urinary disorders and impotence. They form one of the ten ingredients which constitute the *Dashamūla* of the Hindoo physicians (Dutt).

They are considered astringent, and Bellew states that they are taken by women to ensure fecundity, and an infusion of the stems taken for gonorrhœa (Stewart).

In the Gujrat district of the Punjab, it is used in diseases of the kidneys, suppression of urine, also in cough and diseases of the heart (Ibbetson).

In South of Europe, it is used as an aperient and diuretic. (O'Shaughnessy).

In Southern India, the fruit is highly valued as a diuretic. In many cases where this has been tried, the result was quite perceptible in the increase of the urinary secretion. There is another method of administration, in which the fruit and the root boiled with rice to form a medicated water, which is taken in large quantities (Ph. Ind.)

According to Moodeen Sheriff, the fruit and leaves are demulcent, diuretic and useful in cases of strangury, gleet and chronic cystitis. He recommends a decoction and the fresh juice of the leaves.

An infusion made from the fruit has been found very useful as a diuretic in gout, kidney disease and gravel; also used largely in the Panjab as an aphrodisiac (F. F. Perry, in Watts' Dictionary).

205. *T. alatus*, *Delile*. H.F.B.I., I. 423.

Vern. :—Nindo-trikund, gokhuri-kalan (H.); Lotak, bakhra, hasak (Pb.); Latak (Sind).

Habitat :—Sindh and Punjab, at Multan.

A villous and hispid annual. Branches procumbent or ascending. Leaves stipulate, opposite, usually unequal, abruptly pinnate. Leaflets 5 pair, subacute. Stipules ovate, acute. Petals about equalling the sepals. Flowers $\frac{1}{3}$ - $\frac{1}{2}$ in. diam. Peduncles shorter than the leaves. Stamens 5-10. Fruit broadly pyramidal, somewhat pointed; cocci hirsute, 2-seeded, the spines confluent into toothed wings. Fruit slightly bitter, eaten by the desert nomads in Multan.

Part used :—The fruit.

Use :—The fruits are used for the same purpose as those of *T. terrestris*, Linn.

In Baluchistan, the fruit is a domestic remedy for uterine disorders after parturition.

206. *Zygophyllum simplex*, Linn., H.F.B.I., I. 424.

Vern. :—Alethi (Pb.); Alethi; putlani (Sind).

Habitat :—Sandy deserts; Sindh, the Punjab, at Multan: Arabia.

A small prostrate herb, glabrous slender much branched; annual. Leaves simple, cylindrical, small, sessile, fleshy, obtuse; stipules lanceolate, acute. Peduncles as long as the obovate cucullate sepals. Petals spathulate. Scales 2-partite. Capsule deflected, turbinate, rough, of 5 compressed 2-3-seeded cocci. Seeds fusiform, smooth.

Use :—The Arabs beat up the leaves in water and apply the infusion to the eyes in ophthalmia, &c. (Murray.)

207. *Fagonia arabica*, Linn., H.F.B.I., I. 425.

Syn. :—*F. mysorensis*, Roth.

Habitat :—Throughout North-Western India, Sindh, the Punjab and the Southern Provinces of the Western Peninsula.

Sans. :—Dusparsha. Dhanvayās.

Vern. :—Drummahoi (Sind); Samaba (Pb.); J. Indrajī :—(Porebunder and Guj.) Dhamāso; (Marathi) Dhamāsā; (Hindi) Ustargar, Ustarkhar; (Katchi) Dhrāmau.

Pers. :—Bádávard.

A small green spiny undershrub, with erect branches, more or less glandular. Young branches terete, striate, spines exceeding the linear leaflets. Leaves 1-3-foliate; leaflets elliptic or linear, acute; petiole often foliaceous. Flowers small, pale, rose-coloured. Sepals 5, oblong-lanceolate, half as long as the petals, deciduous, imbricate. Petals 5, closed, caducous, imbricate. Disk short, inconspicuous. Stamens 10, inserted on the disk; filaments filiform, naked anthers oblong. Ovary sessile, 5-cornered, 5-celled, tapering into a subulate style. Stigma simple; Ovules, 2 lateral at the base of each cell, pendulous from ascending funicles. Fruit a pubescent, 5-cornered capsule of 5 1-seeded cocci, which dehisce along the ventral suture and separate from a horny endocarp. Seeds punctulate, erect, compressed, broadly oblong, testa mucilaginous, albumen horny; Cotyledons broad, flat, ovate.

Parts used :—The leaves, twigs and juice.

Uses :—The leaves and twigs are supposed to possess cooling properties (Watt).

It has a great reputation as a suppurative in cases of abscesses from thorns, etc. It is also used for cooling the mouth in stomatitis; the juice being boiled with sugar-candy until quite thick, and a small quantity allowed to dissolve in the mouth frequently. The juice is thought to prevent suppuration when applied to open wounds (Dymock).

It is largely used by the native practitioners as a bitter and astringent tonic (S. Arjun).

It is used in Sindh and Afghanistan as a popular remedy for fever among the hill people (Pharmacop. Ind.)

Dose of the cold infusion of the stem, and leaves 5-10 tolas. The infusion is thus prepared:—Take of stem and leaves in sufficient quantity, cut to pieces and add 16 times the quantity of cold water; allow it to remain to be infused for 12 hours; then strain" (Dr. VIRJI JHINA.)

208. *F. Bruguieri*, D.C. H.F.B.I., I. 425.

Vern. :—Spalaghzái (N. W. Himalaya, Trans-Indus); Dhamā, damiyā, dramah (Pb. and Sindh.); Dhamāso (Guz.).

Habitat :—North-West India. Peshawar.

A small, green, spiny, undershrub, with procumbent branches. Internodes short. Lower leaves 3-foliate, the rest 1-foliate; young branches sub-tetragonous, sides grooved, spines (modified stipules) exceeding the ovate, rather fleshy leaflets; young leaflets rather minute. Peduncles solitary from between the spiny stipules. Fruit, a capsule, bearing on its top the remnant of the tapering subulate style.

Part used :—The whole plant.

Use :—The plant is given as a tonic and febrifuge, and in the Peshawar Valley it is given to children as a prophylactic against small-pox (Bellew).

It is useful as an application to tumors, also in chronic fever, dropsy, and delirium, and in any disorder which arises from poisoning. (Punjab Products).

N. O. GERANIACEÆ.

209. *Geranium Wallichianum*, Sweet. H.F.B.I., I. 430.

Vern :—Liljahri, N. W. P. Kao-ashud (Kashmir) Roots.—Mam-i-ran (Pushtu).

Habitat :—Temperate Himalaya, from Nepal to Murree.

A perennial hairy herb. Root-stock thick. Stems robust, 1-4ft., erect. Leaves orbicular, 2-5in. across, palmately 3-5-lobed; segments wedge-shaped, pointed, acutely and irregularly toothed; stipules oblong-ovate, $\frac{1}{2}$ -1in. Flowers blue-purple, $1\frac{1}{2}$ -2in. diam. Sepals abruptly long-pointed. Petals slightly notched, claw hairy (Collett); filaments suddenly dilated at base. Carpels pilose; seeds smooth.

The very large solitary stipules best distinguish this species (Edgeworth and Hook. Fil.).

Use :—Aitchison says the root of this plant was brought to him in Kuram as a valuable medicine known as *Mum-i-ran* (Kuram Valley Flora, J. L. S. xviii-p-26.).

The herb possesses the astringent properties of the genus to a marked degree.

Duthie states, that in the villages of Jumnotri it is employed as a cure for toothache. (WATT.)

210 *G. nepalense*, Sweet. H.F.B.I., I. 430.

Vern :—Rowil ; bhánda (Pb. and H). The root is called *chaud* (Pb).

Habitat :— Throughout the Temperate Himalayas, the Khasia, Nilghiri and Pulney Mountains.

A slender, diffuse and much-branched hairy or villous, glandular herb. Branches sometimes rooting, more or less clothed with spreading or reflexed hairs. Leaves $1\frac{1}{2}$ -2 $\frac{1}{2}$ in. diam., opposite, spreading, 5-gonal, deeply 3-5-lobed or-partite, upper sessile, segments rhomboid, incised ; stipules subulate-lanceolate. Peduncles slender, 1-2-fid sometimes 1-flowered, very variable in length, spreading, reflexed after flowering. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. diam.; pink or purple. Sepals usually silky, shortly awned, almost equalling the entire petals. Carpels hairy. Seeds shining, smooth.

Part used :—The whole plant.

Use :—The plant is used in the Punjab as an astringent, and in certain renal diseases. (WATT).

211. *G. Robertianum*, Linn. H.F.B.I., I. 432.

Habitat :—Western temperate Himalaya, from Kashmir to Garhwal.

A reddish erect, foetid, rather succulent annual or biennial. Branches pubescent, 6-18 in., brittle, leafy, numerous. Leaves 1-3 in., broad ; triangular-oblong. 5-foliate or ternatisect segments, incised or pinnatifid ; petiole long ; stipules ovate. Peduncles slender, 2-flowered, pedicels spreading. Flower-buds pyramidal. Flowers $\frac{1}{2}$ in. diam., streaked with dark and light red. Petals narrow, twice as long as the sepals, claw glabrous. Carpels wrinkled, keeled. Fruit $\frac{3}{4}$ -1 in.; beak of carpels separating upwards from the axis and attached to its apex by silky hairs. Seeds punctulate.

Part used :—The whole plant.

Uses:—This herb, though now almost entirely neglected, was formerly much used in European medicine. It has a disagreeable, bitterish, astringent taste, and imparts its virtues to boiling water. It was formerly employed internally in intermittent fever, consumption, nephritic complaints, jaundice, and as a gargle in affections of the throat, and externally as a resolvent to swollen breasts and other tumours. (U. S. Dispensatory.)

It possesses slightly astringent qualities, and, according to the doctrine of signatures, Sir John Hill informs us that its power to arrest bleeding is indicated by the beautiful red hue assumed by the fading leaves. In Wales it is still administered in medicine, and our never-failing friend Gerarde extols it as an excellent "Stauncher of blood." (Sowerby's English Botany).

212. *G. ocellatum*, Camb. H.F.B.I., I. 433.

Vern:—Bhând (H.)

Habitat:—Hills of the Punjab, temperate and Sub-tropical Himalaya, from Kashmir and the salt range to E. Nipal; Behar, on the top of Parusnatha.

A small straggling annual, hoary-pubescent or hairy and glandular, excessively-branched, prostrate, slender shrub. Leaves orbicular $\frac{1}{2}$ -2 in. diam., rose-coloured, with a dark purple eye. Sepals rigid after flowering, wrinkled from the pressure against the carpels. Petals large broadly obcordate, much larger than the acuminate sepals. Fruit erect, $\frac{2}{3}$ -in., long. Carpels corrugated, small, separating from the axis and beak, which latter eventually coils up elastically. Seeds smooth, shining, pale.

Use:—The plant possesses diuretic and astringent properties. (Watt.)

213. *Oxalis corniculata*, Linn. H.F.B.I., I. 436.
Roxb. 389.

Sans:—Amlalonika; Chángeri.

Vern:—Chalmori; Amrul-sák; Chuka-tripati (B. and H.); Surchi; Khatta mitha (Pb.); Paliákiri; Puli—yarai (Tam); Palla-chinta (Tel); Nalkarda Ambuti; Bhui-sarpati (Bomb.); Taudi

chatom arak (Santal.); chengeri tenga (Assam); Pullampurachi sappu (Kan); Poli yárala (Mal.).

Eng:—The Indian sorrel.

Habitat:—Throughout the warmer parts of India.

An annual or biennial appressed-pubescent, diffuse herb of very variable size and habit. Stems branched, procumbent, without runners. Leaves long-petioled, all cauline, 3-foliate. Leaflets obcordate. Stipules adnate to the petiole. Peduncles axillary; petals yellow, notched. Flowers subumbellate, $\frac{3}{4}$ -in. diam. Sepals obtuse, bracts setaceous. Fruiting pedicels depressed. Capsules tomentose, subcylindric. Cells many-seeded. Seeds transversely ribbed.

Part used:—The whole plant.

Uses:—The leaves are considered by the Sanskrit writers, as cooling, refrigerant and stomachic. The fresh juice expressed from them is said to relieve intoxication from *Datura*; and said to be useful in dysentery and prolapsus of the rectum. (DUTT.)

An infusion of the small leaves is given as a cooling medicine in fevers (Honingberger). It is used externally to remove warts and opacities of the cornea. (B. Powell.)

The fresh leaves made into a curry are said to improve the appetite and digestion of dyspeptic patients. Bruised with or without water, they are formed into a poultice and applied over inflamed parts, by which means, great cold is produced, and pain and other symptoms are relieved. Prepared with hot water, the leaves make a very efficient poultice for boils. The leaves are refrigerant and anti-scorbutic. (MOODEEN SHERIFF.)

In the Concan the plant is rubbed down with water, boiled and the juice of white onions added; this mixture is applied to the head in bilious headache. (DYMCK.)

214. *O. acetosella*, Linn. H.F.B.I., I. 436.

(Sinhalese) Hin-Embul-Sinhiliya.

Habitat:—Temperate Himalaya, from Kashmir to Sikkim. One of the commonest weeds throughout Ceylon.

A pilose stemless herb. Root-stock creepy scaly. Leaves all radical, 3-foliate; leaflets broadly obcordate, often purple beneath, $\frac{1}{2}$ - $\frac{3}{4}$ in., petioles 3-6 in., stipules large broad membranous. Scape axillary, slender, 2-bracteate, about the middle. Flowers yellow, solitary, $\frac{1}{2}$ - $\frac{3}{4}$ in., diam. Sepals oblong. Petals obovate white or pale-rose, veined with purple, erose, cohering above the claw. Capsule erect, pentagonal. Cells 2-3-seeded. Flowers throughout the year. Leaves have an acid taste. Very common in cultivated ground.

Uses:—Although at one time this found a place in the London Pharmacopœia, yet in India no account appears to exist of any supposed medicinal virtues inherent in this species. In Europe it was introduced into the Pharmacopœia as a refrigerant in fever, and as an anti-scorbutic in scurvy, but has now fallen into disuse. (WATT.)

The leaves contain a large quantity of binoxalate of potash, when the juice is evaporated, this salt is deposited in crystals, and so prepared was formerly sold as "salt of lemons" or "salts of sorrel," for removing iron stains; but since the manufacture of oxalic acid from other sources, it is seldom used.

A decoction of the leaves in whey is used in the Hebrides for putrid fevers; infused in water they form an agreeable cooling drink in all febrile disorders, and a conserve made of the leaves beaten up with sugar is recommended for the same purpose.

The wood sorrel approaches the nearest of all our native plants to the Sensitive plant, not only closing its petals and folding its bright green leaves at sunset and with every change of atmosphere but even if the stem be rudely or repeatedly struck. (Sowerby's English Botany).

215. *Biophytum sensitivum*, D.C. H.F.B.I.,
I. 436.

Sans:—Jhalla-pushpa.

Vern:—Lahân Amulki, Ladjri (Mar.); Zarer (Guj and Porebunder); Lak-Chana, Lajalu, zarair; (Hind); Gas-nidikumba (Sinhalese).

Habitat.—Throughout the hotter parts of India, ascending to 6000ft. in the Himalayas; Lower country, Ceylon.

An annual, rarely perennial herb. Stem simple long or short, slender or robust, hispidly pubescent. Leaves $1\frac{1}{2}$ -5in.; petiole hispidulous or merely ciliate; leaflets very variable in size $\frac{1}{4}$ - $\frac{1}{2}$ in., sometimes arched a little upwards, 6-15 pair, oblong, nearly straight, nerves few or many, rather oblique, often waved. Peduncles very variable, $\frac{1}{2}$ -5in., hispid, sometimes swollen at the tip; bracts rigid, setaceous, pedicels usually shorter than the sepals, sometimes equalling them or a little longer. Sepals usually much exceeding the capsule, rigid, sub-lanceolate, grooved, glandular and hispid. Petals usually twice as long as the sepals. Capsule elliptic, shining, cells few-seeded. Seeds with obliquely transverse, acute or obtuse tubercled ridges, very variable.

Flowers throughout the year. Petals golden-yellow with red veins.

Uses.—The seeds are powdered and applied to wounds, and with butter to abscesses to promote suppuration; the root in decoction is given in gonorrhœa and lithiasis (Rheede).

J. Indrajī on the authority of Vaidya Rugnathji says that the leaves act as a diuretic when given internally rubbed with water. They allay thirst in bilious fevers. Dose $\frac{1}{4}$ - $\frac{1}{2}$ a tola (Virji Jhinā).

216. *Averrhoa carambola*, Linn. H.F.B.I., I. 439.
Roxb. 387.

Sans.—Karma ranga.

Vern.—Karmal, Khamrak Kámarángá (H); Kámarángá, Kamarak (B); Kardai (Ass); Tamarak, Kamarakha (Guj); Kámaraka (Mar); Khamaraka, karamara (Bom); Khamrak (Deck); Tamarata, tamarttamkáy (Tam); Karomonga, tamartakáya (Tel); Tamarat-tuka (Mal); Kamarak (Ran).

Eng.—Gooseberry tree or Chinese Gooseberry (Balfour).

Habitat.—Cultivated in gardens throughout the hotter parts of India as far north as Lahore. Common in Cylon gardens introduced from the New World by the Portuguese, says Trimen.

Two varieties are known : say some writers sweet and sour.

K. R. K. The fruit is sour when unripe and acid-sweet when ripe.

A small densely branched tree. "Bark dark grey with horizontal folds. Wood white, turning light red, moderately hard, close-grained. Pores moderate-sized, often subdivided or disposed in short radial lines, scanty, prominent on a vertical section. Medullary rays very fine, very numerous and regular, somewhat indistinct" (Gamble). Leaves alternate, exstipulate, pinnate with a terminal leaflet. Leaflets subopposite, ovate, acuminate or ovate-lanceolate, acute, glabrous and glaucous beneath, 2-5 pair, $1\frac{1}{2}$ -3in. ; petiole stout, pubescent. Flowers small, variegated white and purple ; panicles axillary, sometimes on the old wood. Calyx glabrous, half as long as the petals. Stamens 10-5 shorter without anthers, or sometimes one or two of these longer and antheriferous. Ovary pubescent. Fruit yellow, changing into brown ; ellipsoid, 3in. long with 5 prominent ridges, converting the fruit into one of 5 acutely angled lobes. Seeds arillate ; aril 2-lobed, lacerated. With regard to the arillus Brandis remarks thus :—Funicle of seed dilated "into a fleshy, bilabiate, irregularly cut arillus." It must be noted that, according to Edge. and Hook, F. the leaflets are irritable to touch.

Parts used :—The leaves, root and fruit.

Uses :—Used as a cooling medicine.

The acid dried fruit is given in fevers (Irvine p. 55.) It is cooling and useful in feverishness and possesses anti-scorbutic properties (Watt's Dictionary I. p. 360.)

"The ripe fruit, which is generally sour (though there is a sweet variety) and contains oxalic acid, is a good remedy for bleeding piles, particularly in that variety of the disease which is known as internal piles. I have used it in several cases with more or less benefit, but in a few the result was very satisfactory, the bleeding disappearing rapidly and permanently. There is no doubt that the fruit will also produce a good effect in hæmatemesis, melæna, and some other forms of hæmorrhage,

but as it is not always procurable, I have not yet had an opportunity of trying it in those diseases. The fruit is also useful in relieving thirst and febrile excitement." (Moodeen Sheriff.)

217. *A Bilimbi*, Linn. H.F.B.I., I. 439. Roxb. 387.

Vern:—Belambu, Bilimbi, *Hind.* and *Dek.* *Koch-chit-tamarta-káya*, *Pulich-chakkáy*, *Bilimbi-káya*, *Tam.* *Pulusu-káyalu*, *Bili-bili-káyalu*, *Bilimbi-káyalu*, *Tel.* *Vilanbikká*, *Vilimbi*, *Karichakká Malgal*. *Bilimbi*, *Beng*; *Bombay* *Bilambu*, *Guz.* *Kaála-Zoun-si*, *Kala-Zounya-si*, *Bur.* (Sinhalese) *Bilin*.

Habitat:—Cultivated in gardens throughout India, also naturalized as an escape. Cylon gardens, cultivated.

A small tree. Wood white, tough, soft, very even-grained. Pores small or moderate-sized, sometimes subdivided, very scanty. Medullary rays extremely fine and indistinct, numerous. Faint pale concentric regular bands, (Gamble). Leaves paripinnate, alternate. Leaflets 6-14 pair, lower smallest, subopposite, ovate-oblong, acuminate, unequal-sided at the base, glabrous, pubescent on the nerves beneath, pale beneath; blade 2-20in. by 1-15in.; petiolules short. Flowers dark purple brown says Talbot, dark crimson in Bombay (K. R. Kirtikar), cauliflorous in short panicles from the old wood of the stem and branches and from tender branches also. (K. R. K.). Bracteoles subulate. Sepals ovate, glabrescent, or with a few shining hairs. Petals much longer than the sepals, pubescent. Fruit oblong, acid, slightly furrowed, 2in. long, obtusely lobed, juicy, greenish, yellow when ripe. Seeds without an arillus.

Part used:—The fruit.

Uses:—Astringent, stomachic and refrigerant.

The syrup of fruit is useful in relieving thirst, febrile excitement, and also in some slight cases of hæmorrhage from the bowels, stomach, and internal hæmorrhoids. The fruit itself, in the form of curry, is a useful dietary article in piles and scurvy.

Preparation:—Syrup: Take of the juice of the ripe fruit, strained through cloth, ten fluid ounces; refined sugar, thirty

ounces; water, ten fluid ounces; mix and heat all the ingredients on a slow fire till the sugar is dissolved and the liquid assumes the consistence of a thick syrup. (MOODEEN SHERIFF.)

218. *Impatiens Balsamina*, Linn. H.F.B.I.,
I. 453.

Vern:—Gul-mendi (H); Dupati (B); Haragaura (Uriya); Mujethi (N. W. P.); Bantil, trual, halu; tatura; pallu; tilphar; juk (Pb.); *Teradā* (Bomb.) (Porebunder) Gulmendi; (Guj) Pan tambol; (Sinhalese) Kudalu-kola.

Habitat:—Found throughout India. Ceylon 2-4000ft. common.

An annual erect herb 1-3ft.; Stem glabrous or pubescent, slightly branched, green, pithy, succulent. Leaves alternate, obscurely petioled, 1½-5in. narrowly lanceolate or linear, tapering at both ends, especially at base, coarsely spinous-serrate, the lowest serratures often filiform and glandular, glabrous. Flowers bright pink, rather over lin. diam.; on slender pubescent peduncle much shorter than leaf, 1-3 from axils of upper leaf. Sepals very small, linear; tip keeled, mucronate, hairy; spur 1 in. or more, slender, curved strongly pubescent; standard small, roundish, retuse; wings very much longer, lower lobe very large, bifid, rounded, upper lobe much smaller, obtuse, retuse. Capsule ¾in., pointed, tomentose. Seeds globose, tubercled. It is a rainy-season plant.

Uses:—"It is not known whether any of the Indian Species of *Impatiens* have attributed to them medicinal properties; *I. Noli-me-tangere* (a British Species) has an acrid burning taste, and when taken internally, acts as an emetic, cathartic and diuretic. It is considered too dangerous, however, to be of much use. The *United States Dispensatory*, after having previously discussed the properties of *I. fulva*, *I. pallida*, and *I. Noli-me-tangere*, states that *I. Balsamina* resembles the other species in its effects. Baillon says of *I. Noli-me-tangere* that it was formerly valued as a diuretic and anti-hæmorrhoidal. It was topically used for pains in the joints and was said

to cure diabetes but is not much thought of at present. In Japan *I. corunta* is said to make the hair grow." (WATT.)

Throughout the Tropical and subtropical India and Ceylon. Trimen says that variety *I. corunta*, Linn. is considered to be the original garden Balsam. The common garden Balsam is a very variable plant.

N. O. RUTACEÆ.

219 *Ruta graveolens*, Linn. *Var. angustifolia*,
H.F.B.I., I. 485.

Syn:—*R. angustifolia*, Pers.

Vern:—Sudáb, pismarum; satari; (H); Sadaf (Dec); Arvada (Tam); sadapa (Tel); Nagadab—sappu (Kan); Sadap (Guz); satap (Bom). Ispund; Erunel (B).

Habitat:—Cultivated in India.

"The species of the Genus *Ruta* are herbs or under shrubs natives of the temperate regions of the Eastern Hemisphere. The leaves are beset with small glands, containing a powerfully smelling oil: they are pinnate or much divided. The flowers are yellowish or greenish, and arranged in terminal corymbs or racemes. The Calyx has four persistent sepals; the petals are four; style one; fruit capsular, 4-celled with 6-8 seeds in each cell."

The Common Rue (*R. graveolens*, Linn.) a native of the South of Europe is commonly cultivated in England. It is a somewhat shrubby plant, 2-3ft. high, with pinnately divided bluish green leaves and yellowish corymbose flowers. The first that opens has usually ten stamens, the others have eight stamens only. These stamens are of unequal length; each is bent inwards to touch the pistil, and after the pollen has been shed it bends back again. The powerful fetid odour and acrid taste of this plant depends on the presence of a volatile oil (M. T. Masters).

Parts used:—The leaves, herb and oil.

Uses:—The dried leaves are used as a fumigatory for children suffering from catarrh; powdered and in combination with aromatics they are given in dyspepsia; with the fresh leaves, a tincture is made which is used as an external remedy in the first stages of paralysis. In the Punjab, the leaves are used as a remedy for rheumatic pains. Rue in all its forms is considered injurious to pregnant women.

The herb and the oil act as stimulants chiefly of the uterine and nervous systems. Rue has also been regarded as an anthelmintic. In large doses it is an acro-narcotic poison. When fresh its topical action is acrid, and if much handled it produces redness, swelling and even vesication.

It may be given internally in hysteria, amenorrhœa, epilepsy, flatulent colic, &c., and externally may be used as a rubefacient. The oil is the best form for administration, but rue tea is a popular remedy. The dose of the powdered leaves is 10 grs. to one drachm; of the oil one to four minims. (WATT.)

The dry rue leaves in the form of infusion and tincture are beneficial in dyspepsia with flatulency, flatulent colic and slight cases of amenorrhœa; the juice of the leaves has a distinct control over infantile convulsions. (MOODEEN SHERIFF.)

Rue is used by Arabs in Palestine and Syria as a preventive of the ill affects of water drunk at unaccustomed springs: they either chew the leaves, or soak the plant in water. (FULLERTON.)

Rutin, which is obtained from Rue, and quercitrin, are isomeric compounds of a composition represented by Herzig's formula for the latter, $C_{36}H_{33}O_{20} + 3H_2O$. The product obtained by the decomposition of rutin with dilute mineral acids is named *isoquercetin*, and differs in physical properties from quercetin, which is similarly prepared from quercitrin. Isoquercetin is less soluble than quercetin, gives a dirty green coloration with ferric chloride which on warming turns bright red, whilst quercetin with ferric chloride forms a dark green solution which on warming becomes dark red. I. Ch. S. 1897 A I. 433.

220. *Peganum Harmala*, Linn. H.F.B.I., I. 486.

Vern:—Hurmul, harmal, isband-lahouri, lahouri-hurmul, (Hind); Isband (Beng); Hurmul, isbund-lahouri, lahouri-hurmul spelane. (P. B.); spail anai, (Pushtu); spand, spong, ispanthan, (N. Baluchistan); Hurmul, isbund-lahouri, lahouri-

hurmul (Sind); Vilayati-mhendi, vilayati-isband (Dec); Hurmal, purmaro, isband. (Bomb); Harmala, (Mar); Ispun, Hurmaro; (Guz); spimai-aravandi, virati, shimai-azha-vanai-virai, (Tam); Sima-goronti-vittulu, (Tel) Hurmul or harmal, (Arab); Isband, or isband, (Pers).

Habitat:—N. W. India, from Sindh, the Punjab, and the Kashmir plain to Delhi and Agra; the Western Deccan.

A glabrous bush. Stem 1-3 ft. high, stout, flexuous, dichotomously and corymbosely much branched and densely foliated. Leaves 2-3 in., green, pinnatifidly cut into linear, very narrow acute spreading lobes. Flowers $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., solitary in axils of the branches, sessile or pedicelled. Calyx-tube very narrow, much exceeding the Corolla, persistent. Sepals 4-5. Petals 4-5, subequal imbricate, elliptic-oblong. Stamens 12-15, inserted at the base of the disk, some antherless; filaments dilated below; anthers linear. Ovary globose, deeply 2-3-lobed; styles basal, twisted, 2-3, keeled above, the keels stigmatose; ovules many in each cell, inserted in the inner angle. Fruit a globose capsule $\frac{1}{2}$ in. diam., and less. Seeds angled, testa spongy, rough; albumen fleshy; embryo curved.

Parts used:—The seeds, leaves and root.

Use:—In Native works on Materia Medica, it is described as an alterative and purifying medicine in atrabilis, and also in diseases supposed to arise from cold humors, such as palsy, lumbago, &c.; it is also said to stimulate the sexual system both in the male and female, increasing the flow of milk and menses in the latter. (DYMCK.)

In the Punjab, the seeds are considered narcotic and given in fevers and colic. The decoction of the leaves is given for rheumatism, and the powdered root mixed with mustard oil, is applied to the hair to destroy Vermin. STEWART.)

In Gujrat, it is burnt in the sick-room as an antiseptic and deodorizer when any person suffers from wounds, ulcers, or small-pox. (Ibbetson's Gazetteer of Gujrat: p. 12.)

The Natives of the Punjab use these seeds against weakness of sight and retention of urine. (Honingberger, Vol: II. p. 284).

Dr. P. Gopal, of Bombay, has found the infusion or tincture of the drug to act as stimulant emmenagogue, producing slight intoxication like *Cannabis Indica*. He gave the tincture in $\frac{1}{2}$ drachm doses to a female suffering from amenorrhœa, and it had the effect of producing a free menstrual discharge; he further says that it is sometimes used by the native midwives to procure abortion. He believes that it has properties in common with ergot, savine and rue. (Dymock p. 125.)

According to Moodeen Sheriff the seeds are narcotic, antispasmodic, hypnotic, anodyne, nauseant, emetic and emmenagogue. He recommends their employment in cases of asthma, hiccough, hysteria, rheumatism, impaction of calculus in the ureter, and of gallstone in the gall duct, colic, jaundice, dysmenorrhœa and neuralgia; in all of which they relieve pain and procure sleep. The relief afforded by this drug in simple cough and a few other pectoral affections is generally satisfactory. It is also a good nauseant and depressant emetic in its largest medicinal doses (3 i ss. to 3 ii); but it cannot be employed as such in general practice, because its use in so large a quantity is always accompanied by its narcotic and hypnotic actions. "No Hospital should be, in my humble opinion," wrote the late Dr. Moodeen Sheriff, without a drug so cheap and with so many good qualities as *Hurmal*."

According to J. A. Gunn (Royal Society, Edinburgh, 22, November 1909) harmaline belongs to the group of protoplasmic poisons of which the best known alkaloid is quinine, and the actions of harmaline and quinine are practically the same, so that it is possible that harmaline may come to be used as a substitute for quinine.

Harmaline has been shown to be dihydroharmine; both it and harmine are optically inactive in acetic acid solution. The oxidation of harmaline, $C_{13}H_{14}N_2O$, to harmine, $C_{13}H_{12}N_2O$, is best effected with potassium permanganate in dilute sulphuric acid solution. Methylharmine melts at 209° ; its hydrochloride and flesh-coloured platinochloride, $(C_{13}H_{11}MeN_2O)_2 \cdot H_2PtCl_6 + 2H_2O$, were prepared; it unites with more methylic iodide, yielding a quaternary iodide, $C_{13}H_{11}MeN_2O \cdot MeI$, which reacts with silver nitrate, forming the crystalline nitrate; the platinochloride, and aurochloride of this quaternary base were also prepared. Acetylharmaline, $C_{13}H_{13}AcN_2O$, can be prepared by dissolving harmaline and fused sodium acetate in acetic anhydride, heating

cautiously to 60° and then setting it aside; it melts at $204-205^{\circ}$. *Methyl-harmaline*, prepared from harmaline methiodide by boiling it with baryta water, melts and decomposes at 162° , and will unite with more methylic iodide. Dihydroharmaline is best prepared by reducing harmaline with sodium in boiling amyl-alcoholic solution; its *acetyl* and *benzoyl* derivatives, $C_{13}H_{15}AcN_2O$, etc., melt at 239° and $158-159^{\circ}$ respectively. Harmine and harmaline are oxidised to harminic acid, $C_{10}H_8N_2O_4$, by chromic acid in boiling acetic acid solution, or by nitric acid, the same product being obtained when harmol, dichloroharmine, or introharmine is oxidised. This acid reacts with normal alkali like a monobasic acid, but with resorcinol, like a dibasic acid, forming a fluorescein. It reacts with methylic iodide and aqueous potash, yielding *mythl harminic acid*, $C_{10}H_7MeN_2O_4$, which can also be obtained by the oxidation of methylharmine, and which blackens between 260° and 280° when heated; with ethylic iodide, it yields *ethylharminic acid*, $C_{10}H_7EtN_2O_4$, which blackens at 280° . Apoharmine, formed from harminic acid by the loss of 2 mols. of carbonic anhydride, yields a yellow *picrate* melting at 247° , boiling concentrated nitric acid converts it into a derivative, $C_8H_7(NO_2)N_2$, which melts and decomposes at 270° , and is soluble in alkalis; with methylic iodide, it yields the hydriodide of *methylapoharmine*, $C_8H_7MeN_2$, which base melts at $77-78^{\circ}$, and yields a yellow *platinochloride* which decomposes at 260° .

J. Ch. S. 1898 A. I. 164.

Harmalol has been isolated from the seeds of *Peganum harmala*, and is identical with the product obtained by the action of concentrated hydrochloric acid on harmaline; the green fluorescence of its aqueous solution is almost completely destroyed by acids or alkalis. Harmine melts at $257-259^{\circ}$. Harminic acid is an ortho-dicarboxylic acid, but on titration behaves like a monobasic acid, one carboxyl group being combined as in a salt. Apoharmine is decomposed by potassium permanganate, forming ammonia and oxalic acid; its nitro-derivative has both acid and basic properties (compare the nitroimidazoles of Bamberger and Berlé). The *aurochloride* crystallises in orange-yellow needles concentrically arranged. Harmol can not be directly reduced by the action of hydriodic acid or of zinc dust, but the oxygen may be eliminated indirectly by means of the amino-derivative.

Aminoharman, $C_{12}H_{11}N_3$, prepared by the action of ammonio-zinc chloride and ammonium chloride on harmol at 250° , crystallises from water in flat needles or leaflets, has a silvery lustre, sinters at 292° , melts at 298° , sublimes with partial decomposition, and is easily soluble in alcohol. The solutions of the salts show a blue fluorescence. The *hydrochloride* crystallises in colourless prisms, and is slightly soluble in water; the nitrate and sulphate were also prepared.

Harman, $C_{12}H_{10}N_2$, obtained by diazotising the amino-derivative, resembles harmine, and separates in leaflets or flat needles; it crystallises from benzene in small stout crystals, melts at 230° , sublimes with partial decomposition, forming a sublimate which crystallises in needles, and is readily soluble in ethyl or methyl alcohol. Its solution in concentrated sulphuric acid has a faint blue fluorescence, whilst the solutions of its salts show a strong blue fluorescence. The *platinochloride*, $(C_{12}H_{10}N_2)_2 \cdot H_2PtCl_6 \cdot \frac{1}{2}H_2O$,

crystallises in pale yellow needles and is slightly soluble in water, the *aurichloride* separating in matted, orange needles and the *mercurichloride* was also prepared.

Harmaline crystallises from alcohol or benzene in large, colourless crystals which, in thicker layers, appear yellow. Its solution in concentrated sulphuric acid is intensely yellow but not fluorescent, whilst the alcoholic solutions of the yellow salts have a green fluorescence. By the action of hydrochloric acid on a boiling solution of acetyl-harmaline in alcohol, the solution becomes brown, green and finally dirty blue, and from the product ammonia precipitates a strong base, $C_{15}H_{13}O_3N_2$, in almost colourless needles or leaflets; it separates from water in yellow crystals, melts at $164-165^\circ$, is easily soluble in hot water, and forms yellow solutions in acids. The *platinichloride*, $(C_{15}H_{13}O_3N_2)_2 \cdot H_2PtCl_6$, crystallises in lustrous, brown needles, and decomposes at 210° . The *aurichloride* is difficult to obtain in a crystalline form. The *mercurichloride* was also prepared. The base is only reconverted into harmaline by prolonged boiling with alcoholic potash, and by the action of hydrochloric acid at $150-160^\circ$ it forms harmalol. When harmaline is boiled with nitric acid of sp. gr. 1.48, nitroanisic acid [$OMe : NO_2 : CO_2H = 1 : 2 : 4$] is formed together with harminic acid. The former acid is derived from methoxy-nitrophthalic acid by elimination of carbon dioxide. The harmaline alkaloids must therefore contain a complex, $OMe.C_6H_3(C-)_C$, in which $OMe : C : C = 1 : 3 : 4$ or $1 : 4 : 5$.

The physiological effect of these alkaloids is to reduce the temperature.

J. Ch. S. 1901 A. I. pp. 405-406.

The physiological action of some of the derivatives was investigated, namely, harmine ($C_{13}H_{12}ON_2$), harmaline ($C_{13}H_{14}ON_2$), dihydroharmaline ($C_{13}H_{16}ON_2$), and apoharmine ($C_8H_9N_2$). The first three have a paralysing action on frogs, whilst apoharmine causes increased reflex irritability and tetanus. Harmine and harmaline paralyse the skeletal and cardiac muscle of the frog. Harmaline has an anthelmintic action, probably by paralysing the musculature of the parasites. In warm-blooded animals, harmine and harmaline cause convulsions, increase of saliva, interference with respiration, and depression of temperature. In the East the seeds are used as a substitute for hashish, and in dogs it is evident that psychic disturbances occur. The drugs are partly destroyed in the body (blood, liver, and nervous system), and partly excreted by the kidneys and intestine.

J. Ch. S. 1911, A. II. p. 138.

On treating harmaline, harmine, apoharmine, and methylapoharmine with bromine in acetic acid, the *hydrobromides* of the corresponding monobromo-derivatives are obtained. *Bromoharmaline*, $C_{15}H_{13}ON_2Br$, crystallises in colourless, slender needles, m. p. 195° ; the *hydrochloride* and *platinichloride* are yellow. In the case of harmine, two isomeric compounds are formed, and may be separated by heating the hydrobromides at 50° , *bromoharmine hydrobromide* alone fusing at this temperature. *Bromoharmine*, $C_{13}H_{11}ON_2Br$, occurs in orthorhombic prisms, m. p. 275° ; the salts crystallise from alcohol, but form jellies with water. *isobromoharmine* crystallises in long needles, m. p. 203° , and its salts crystallise from water; the *platinichloride* is orange-red.

Bromoapoharmine $C_9H_7N_2Br$, crystallises in long needles, m. p. 229° , and *bromomethylapoharmine*, $C_9H_7N_2Br$, in needles, m. p. 196° .

On brominating, harmine in presence of sulphuric acid, and suspending the product, Fischer's supposed tetrabromide, in hot dilute alcohol, slender needles of *dibromoharmine monohydrobromide* are obtained; when treated with ammonia this gives *dibromoharmine*, $C_{13}H_{10}ON_2Br_2$, m. p. 209° . Fischer's compound appears to be the *dihydrobromide* of this base.

J. Ch. S. 1912, A. I. p. 209.

221. *Dictamnus albus*, Linn. H.F.B.I., I. 487.

Habitat:—Temperate Western Himalaya, from Kashmir to Kunawur, and according to Royle, Jumnotrie in Garwhal.

A strong-smelling herb; shrubby below, clothed with pustular glands. Stem stout but not woody, branched. Leaves 1ft. and upwards, alternate, unequally pinnate. Leaflets opposite, ovate or ovate-lanceolate, serrulate, 2-3½ in., sessile, dark green, base wedge-shaped, nerves slender, petiole very stout, angular, margined. Racemes terminal, 4ft. and upwards, stout, strict, erect. Flowers white or rose-coloured, 1½ in. long, erect; pedicels 1-3 in.; glandular, bracteate at the base and bracteolate usually above the middle. Calyx 5-partite; deciduous. Sepals small, lanceolate. Petals 5, 4 upper in pair, ascending, lower declinate; elliptic-lanceolate, glandular on the back. Stamens 10, inserted at the base of a thick annular disk; filaments long, slender, somewhat thickened and very glandular below the slender tip; anthers subglobose. Ovary shortly stipitate, deeply 5-lobed, 5-celled. Style hispid, filiform, declinate. Stigma terminal. Ovules 3-4 in each cell, inserted on the ventral suture. Fruit of 5 carpels compressed, broad, truncate, long-beaked, elastically 2-valved, 2-3 seeded, hispid 1 in. long. Endocarp horny, separable. Seeds subglobose; testa thin, black, shining, albumen fleshy; cotyledons thick, radicle short.

Uses:—Indian writers do not appear to have paid much attention to this plant. The bark of the root was once upon a time a favorite aromatic bitter. Storck prescribed it for most nervous diseases, also for intermittent fever, amenorrhœa, hysteria, etc. (WATT).

222. *Zanthoxylon alatum*, Roxb. H.F.B.I.,
 1. 493. Roxb. 717.

Sans:—Tumburu.

Vern:—Tejbal, tumru (H); Nepáli dhaniá (B). Sungrúkúng (Lepcha);

Habitat:—Hot valley of the Sub-tropical Himalaya; from Jamu to Bhotan; Khasia Mountains.

Hot valleys in forest undergrowths upto 6000ft. in Jau-nasar, Tehri-Gurhwal and the Outer-Himalaya from above Rajpur, Dharmigadh, Tons, and Bamsu valleys; Korwa, Koti Forest (Kanjilal), Monghyr, Khasia and Naga hills, Hills of Vizigapatam and Ganjam.

A shrub or small tree almost entirely glabrous with a strong aromatic smell. Bark corky. Young stems with thick conical prickles from a corky base. Wood close-grained, yellow, says Gamble, white, says Brandis. Prickles shining, strong, broad, flat on branchlets petioles and midrib; thin on older branches, often on a corky base. Leaves alternate, imparipinnate, small. Leaflets 2-6 pair commonly; petiole and rachis narrowly winged opposite, obtusely acuminate, more or less serrate, 1-3 by $\frac{1}{2}$ by $\frac{3}{4}$ in., elliptic-lanceolate, pellucid-punctate; secondary nerves distinct. Flowers small, yellow, usually unisexual, in dense lateral panicles; sparingly branched. Calyx 6-8-fid. Petals none. Stamens 6-8, much exceeding the Calyx. Anthers large. Fruit usually a solitary carpel dehiscing ventrally, size of a pepper corn, tubercled, strongly aromatic: rugous, red; rarely 2-3.

Parts used:—Seeds, bark and fruit.

Uses:—Seeds and the bark are used as an aromatic tonic in fever, dyspepsia, and cholera; the fruit as well as the branches and thorns are used as a remedy for tooth-ache, also deemed stomachic and carminative and employed to intoxicate fish.

The carpels of the fruits, which resemble those of coriander, yield an essential oil, which is isomeric with turpentine and is somewhat similar to eucalyptus oil in odor and properties. The oil may be found to possess

antiseptic, disinfectant and deodorant properties similar to those of eucalyptus.

The bark of this and of the following species contains berberine (K. L. Day).

223. *Z. acanthopodium*, D. C. H.F.B.I., I. 493.

Vern :—Nipáli dhanya; tumra; tejphal; darmar (H); Thumbul (B); Bogay timur (Nepal).

Habitat :—Hot valleys of the Sub-tropical Himálaya, from Kumaon to Sikkim and the Khasia Hills.

A small tree. Bark $\frac{1}{8}$ in. thick, greyish brown, shining, studded with the large conical corky bases of the prickles, which fall off as the tree grows. Wood yellowish white, soft. Pores small, often in short radial lines. Medullary rays fine. (Gamble).

Branchlets glabrous or tomentose, leaflets 2-6 pairs, lanceolate, nerves distinct, glabrous or more or less pubescent beneath, petioles and rachis narrowly winged. Cymes very short, dense, $\frac{1}{2}$ -lin. long, pubescent. Flowers apetalous. Wood, with a broad septate pith, adds J. D. Hooker.

Use :—See *Z. alatum* above.

224. *Z. oxyphyllum*, Edgew. H.F.B.I., I. 494.

Habitat :—Himalaya, from Garhwál to Bhutan, also Khasia Hills.

A climbing shrub, clothed with hooked prickles. "Bark greyish brown, covered with large corky lenticels, and armed with recurved thorns on a conical corky base, often $\frac{3}{4}$ in. high. Wood yellowish white, soft, porous. Pores large, usually many times subdivided radially. Medullary rays moderately broad, bent where they pass the pores. Annual rings marked by a white line" (Gamble). Leaves very variable in size, 4-12 in., petiole arched, usually very prickly along the back. Leaflets, 3-10 pair, alternate or opposite; in young specimens ovate-lanceolate, very long-acuminate, crenate-serrate, pale; nerves very distinct beneath, in older ones more elliptic or oblong, 2-2 $\frac{1}{2}$ in. to upwards of 4 in., coriaceous, shining above. Cymes much-branched, many-flowered. Flowers the largest of the

Indian species, lilac, $\frac{1}{4}$ – $\frac{1}{2}$ in. diam., umbellate on the branches of the cyme; pedicels slender, longer than the petals. Sepals 4, small, obtuse. Petals 4, obtuse, imbricate. Ripe carpels 2-4, of the size of a pea, tuberculated, hardly beaked. Seeds black.

Use:—See *Z. alatum* above.

225. *Z. Hamiltonianum*, Wall., H.F.B.I., I. 494.

Vern.:—Purpuray timur (Nepal).

Habitat:—Sikkim, Assam and Burma.

A climbing thorny shrub. Bark dark grey, with white lenticels, armed with short recurved prickles on a thick, nearly cylindrical corky base, often $\frac{3}{4}$ in. high. Wood yellowish white, soft. Pores fine, not numerous. Medullary rays fine to moderately broad, numerous, nearly equidistant (Gamble). Leaves 6-8 in., common petiole not winged, terete, stout, very prickly; leaflets sub-sessile, suddenly narrowed into a broad notched apex, base rounded, glossy on both surfaces, glabrous or pubescent beneath, with many sub-parallel prominent arching nerves. Cymes 3-4 in., paniced, imbricate. Panicles or clusters of flowers axillary, ramifications alternate. Sepals 4. Petals as many. Flowers green. Stamens 4, hypogynous. Ovary 1-celled; stigma capitate. Fruit globose, of 1-seeded carpel. Seed shining black; embryo in a fleshy albumen, radicle short, cotyledons flat.

Use:—The fruit employed medicinally like that of *Z. alatum*.

226. *Z. Rhetsa*, D. C., H.F.B.I., I. 495.

Syn.:—Fagara Rhetsa, Roxb. 140.

Vern.:—Tessul, Koklee, chirphal, triphal (Bomb. and Goa). Vengurla. Rhetsa manm (Tel.); Jummina, jisumi-mara (Kan.). Katu Kina (Sinhalese).

Habitat:—Western Peninsula, from Coromandel and the Concan southward. Occasionally cultivated in Ceylon.

A large tree. "Bark cream-coloured, with thick cork in irregular masses, studded with conical spines, about 2 in. long, and the same in base diameter. Wood yellowish grey, moderately hard, close-grained. Pores small, rather scanty,

single or in radial strings of 2-4. Medullary rays short, white, numerous, the distance between them about equal to the diameter of the pores. Annual rings, marked by the darker autumn wood, with few pores" (Gamble). Branches opposite. J. D. Hooker says that the wood has broad septate pith, and the leaves are 5-merous-foliate; petiole not winged. "The prickly stem resembles that of the *Bombax*. Leaves 1-1½ ft., clustered at the ends of the branches, equally or unequally pinnate; petiole unarmed. Leaflets opposite, 3-5 in., with short partial petioles, recurved, ovate-oblong or lanceolate, caudate-acuminate, upper base, rounded, lower narrow and ending in the costa, nerves 10-12 on the upper half, fewer on the lower. Flowers yellow, in large terminal panicles" (Brandis). J. D. Hooker says: "Cymes terminal, very large, glabrous. Sometimes 1½ ft. broad; branches opposite, angled; bracts minute caducous." Flowers 4-merous, ½ in. diam. Petals valvate. Ovary globose. Ripe carpels solitary, the size of a pea, tubercled. Seed subglobose, blue-black. The unripe carpels taste like orange peel, the seeds like black pepper.

Parts used:—The carpels, oil, bark and root-bark.

Uses:—The fruit is used for its aromatic and stimulant properties. The Mohamedan physicians consider it to be hot and dry, and to have astringent, stimulant and digestive properties. They prescribe it in dyspepsia arising from atribilis; also in some forms of diarrhoea. The root-bark is reputed in Goa to be purgative of the kidneys. The fruit with ajwan seeds is powdered, steeped in water and distilled, and the distillate given as a remedy for cholera. In rheumatism, the fruit is given in honey (Dymock.)

The bark and root-bark are also probably equally valuable. The essential oil is used for cholera (WATT.)

227. *Z. Budrunga*, Wall, H.F.B.I., I. 495.

Syn.:—*Fagara Budrunga*, Roxb. 140.

Vern.:—Budrung (Hin.); Brojonali (Assam).

Habitat:—Tropical Himalaya, Kumaon, forests of Sylhet, the Khasia Mountains, Chittagong, and Martaban.

A tree, armed with prickles. "Bark greyish brown; young stems covered with thick, conical prickles from a corky base. Wood moderately hard, close-grained, white. Pores small, uniformly distributed, often in short radial lines. Medullary rays fine, short, numerous" (Gamble). Brandis says that it is an aromatic evergreen tree. Gamble says:—"It is a pretty tree. When young, the stems are leafless at the top, where the long pinnate leaves are put out umbrella-fashion." Leaflets 5-10 pair, glabrous, broadly crenate, with large glands in the sinus, base very oblique; Cymes terminal, very large, glabrous (J. D. Hooker). Seeds aromatic, says Gamble.

Use.—The carpels can hardly be distinguished from those of *Z. Rhetsa*, and are used similarly in medicine (WATT.)

228. *Toddalia aculeata*, Pers. H.F.B.I., I. 497.

Syn.:—*Scopolia aculeata*, Sm. *Roxb.* 207.

Sans.:—Kānchana; dahana.

Vern.:—Kanj (H.); Dahan, Lahan (Rajputana); Meinkara (Nepal); Saphijirik (Lepcha); Milkaranai, Kandvi, (Tam.); Konda-Kashinda. (Tel.); Jangli-Kāli-mirchi (Bomb.). Kudur-Miris (Sinhalese.)

Habitat:—Throughout India, in Java, Sumatra, China and the Phillippines and Mauritius. Subtropical Himalaya, from Kumaon eastwards to Bhotan; Khasia Mountains, and throughout the Western Peninsula. Ceylon, bushy places, from sea-level upto 6,000ft., very common.

A large scandent shrub, the branches covered with prickles, on broad corky cones, often lin. high. Bark brown, thin, with prominent lenticels. Wood porous, yellowish white. Pores moderate-sized, often undivided, uniformly distributed. Medullary rays very fine, uniform and equidistant, bent where they touch the pores (Gamble). Prickles on branchlets sharp. The woody conical lenticels terminal, in short curved spines. Young shoots rusty, tomentose. Leaflets crenulate, greatly varying in length, in the semi-evergreen scrub, near Madras 1½-2in.,

elsewhere often 4 in. long (called *T. floribunda*.—Wall). Flowers small, cream-coloured, in axillary panicles longer than the petiole; $\frac{1}{2}$ in. diam. Calyx glandular. Petals 5, imbricate. Stamens not exceeding the petals. Ovary usually 5-celled. Style short. Stigma 5-lobed. Ovules 2, superposed in each cell. Fruit globose, size of a large pea, 3-5-grooved, orange-coloured, $\frac{1}{2}$ in. diam.; 3-5-celled. Seeds solitary in each cell. The whole plant hot and pungent.

Parts used :—The root, bark, leaves and fruit.

Uses :—The root is pungent and sub-aromatic, and is considered as stomachic and tonic. It is given in a weak infusion to the quantity of half a teacupful in the course of the day; the leaves are also sometimes used for the same purpose (Ainslie). The fresh leaves are eaten raw for pains in the bowels; the fresh bark of the root is administered by the Telinga physicians for the cure of remittent fever. I conceive every part of this plant to be possessed of strong, stimulating powers, and have no doubt but, under proper management, it might prove a valuable medicine where stimulants are required (Roxb.)

The root-bark is officinal in the Indian Pharmacopœia, being described as an aromatic tonic, stimulant and antiperiodic; useful in constitutional debility, and in convalescence after febrile and other exhausting diseases. Dr. Bidie of Madras says, he knows of no single remedy in which active stimulant, carminative, and tonic properties are so happily combined as in this drug.

Rheede states that the unripe fruit and root are rubbed down with oil to make a stimulant liniment for rheumatism.

“I have been using the root-bark of *T. aculeata* in my practice during the last twelve or thirteen years, and do not hesitate in saying that it is one of the most valuable drugs in India. It is, as antiperiodic and antipyretic, equal, if not superior, to quinine and other alkaloids of cinchona and to Warburg's tincture, respectively; and, as a diaphoretic, decidedly more efficacious than Pulv. Jacobi Vera or James' powder, and a few other antipyretic medicines mentioned

above. It, therefore, demands an especial notice of the medical profession.

"Six drachms of the tincture or twelve ounces of the decoction of *T. aculeata* are equal to one bottle of Warburg's tincture; and if either of them is used in two doses during the presence of simple continued fever or a paroxysm of ague, it produces the same good effect as the latter drug (Warburg's tincture), namely, a copious perspiration and relief of the febrile condition; and, again, if the tincture or decoction is repeated in the same dose during the interval of ague, every fourth or fifth hour, for two or three days, it prevents the return of paroxysm as successfully as very large doses of quinine. To render the cure more perfect and complete, the tincture or decoction should be continued in smaller doses for four or five days more. The beneficial influence of the tincture or decoction of *T. aculeata* in remittent fever is precisely the same, and the only difference is that it sometimes relieves the exacerbation and checks its return at once; and at others, it first converts the remittent into intermittent fever and then cures the latter in the same way as explained above. Out of the many severe and very obstinate cases of malarious, jungle, and other fevers, which yielded to this drug, there were several in which quinine with arsenic was first tried and failed. As the dose of the tincture of *T. aculeata* is much smaller than that of its decoction, and as it can also be prepared and kept always ready for use, it is preferable to the latter; but there is no difference whatever between the medical properties of both preparations.

"The root-bark of *T. aculeata* is not only much cheaper than quinine and Warburg's tincture, but is also one of the cheapest drugs in Southern India, its price being only about 2 annas per pound. In addition to this, its advantages over quinine are that it, unlike the latter, can be freely and successfully administered in the absence as well as in the presence of fever; and that, however long and frequently it may be employed, it never produces ringing in the ears, deafness and some other disagreeable symptoms which are so commonly observed in the use of quinine.

"The analogy between the medical properties of the root-bark of *T. aculeata* and those of the root of *Berberis asiatica* and some other species of *Berberis* is very great. The former, however, has one advantage over the latter, which is its procurability in every large bazar of Southern India; whereas, the Indian Barberry-root requires to be sent for from some hills and distant places, as the Nilgiris, Shevaroy Hills, Calcutta, Delhi, etc" (MOODEEN SHERIFF.)

In the Australasian Congress of 1889, held at Melbourne, Surgeon-Major Kirtikar, in exhibiting the powder of the root, said as follows:—"The plant (Jangli-kāli-mirchi) has been recommended by Dr. Bidie of Madras as a bitter tonic in debility, after malarial fevers, and in convalescence from exhausting diseases. I have tried it in the malarial cachexia of fevers and found that it acts as a good stomachic tonic, improving the appetite, and aiding digestion. An infusion of the root-powder, in the proportion of an ounce of the powder to ten fluid ounces of boiling water, makes a capital preparation. Dose, one to two ounces, twice or thrice daily. Four years ago, I obtained a few pounds of the root from Dr. Dymock and tried it with great advantage. The root contains a bitter principle, the exact nature of which is yet unknown. It was once known in Europe under the name of Lopez-root as a remedy for diarrhoea, probably from the large quantities of yellow resin which the vascular and cortical system contain. "The Bark," says Dr. Dymock, "is remarkable for its large cells filled with resin and essential oil." (P. 949, Proceedings of the Australasian Congress, Melbourne, 1889.)

The central woody portion, the inner bark, and the external yellow powder of the root, were separately examined.

Ten grams of the external yellow powder were digested for two hours with 100 c.c. of boiling alcohol, filtered, and the residue again treated in a similar manner. To the orange brown filtrate alcoholic lead acetate solution was added, drop by drop, as long as a colourless precipitate was formed, and after this was removed by filtration, the filtrate was evaporated to a small bulk and poured into five times its volume of dilute hydrochloric acid. A viscous, yellow precipitate was thus obtained, which increased in quantity on standing; this was collected upon calico, and after being rinsed with cold, was digested with boiling water, the turbid, yellow liquid thus obtained contained resinous matter in suspension, but this was readily

removed by means of ether. After boiling the clear aqueous solution, excess of hydrochloric acid was added; and on cooling, it deposited long, orange-colored needles, which were collected and washed with dilute HCl. To purify this product, it was dissolved in boiling dilute alkali, and the solution digested with animal charcoal, filtered, treated with HCl, and allowed to cool; the yellow needles which separated were collected, washed with water, and allowed to dry at the ordinary temperature. The product weighed 0.35 grams.

This product was identical with Berberine.

The inner bark also contains a trace of Berberine. It contains also some quantity of a sticky, resinous product, which is insoluble in water or dilute acids, but readily soluble in ether, and appeared to be identical with the similar substance present in the yellow powder.

The central woody portion of the root yielded no Berberine.

—J. Ch. S. 1895 T 413.

229. *Skimmia laureola*, Hook. f., H.F.B.I., I. 499.

Syn. :—*Limonia Laureola*, Wall.

Vern. :—Ner; barru; shalangli (Pb.); chumloni (Nepal); Limburnyok (Lepcha).

Habitat :—Throughout the temperate Himalaya, from Murree to Mishmi and Khasia Mountains. In Dun Hills, a common undershrub.

An extremely aromatic, gregarious, evergreen shrub, glabrous wholly, often a small tree in Sikkim. Branched from the base. Branches and foliage very bright green, 3-5 ft. high. Wood close-grained, white, soft, with distinct white concentric white lines. Wood has an aromatic scent when fresh cut. Bark thin, bluish grey. Leaves alternate, simple, quite entire, midrib prominent. Exceedingly variable in size, oblong-linear, elliptic-lanceolate, or obovate-obtuse, acute or cordate-acuminate, 3-7 in. long, softly coriaceous, nerves indistinct; petiole short, stout. Panicles terminal, short, dense-flowered, branched. Females smaller. Bracts and 2 bracteoles deciduous. Flowers 5-merous, about $\frac{1}{2}$ in. diam., yellowish white, inodorous, shortly pedicelled. Sepals small. Petals oblong or obtuse; filaments stout, subulate. Ovary ovoid, minute, conic, 4-cleft in male flowers; style 1.

Fruit $\frac{1}{2}$ - $\frac{3}{4}$ in. long, ellipsoid, red, fleshy. Seeds 1-3. Embryo green. Kanjilal says the odour of the musk-deer is popularly supposed to be derived from it.

Very similar to the Japanese *S. Japonica*, Thumb., but the flowers are 4-merous in that species.

A poisonous alkaloid, *Skimmianine*, has been found to be present in all parts of *Skimmia Japonica*, but most abundantly in the leaves. It was isolated from the latter by extracting with 96 per cent. alcohol. *Skimmianine*, $C_{32}H_{22}O_2N_2$, crystallises from alcohol, in yellow, four-sided prisms, melts at 175.5° and is readily soluble in chloroform or alcohol, moderately so in methyl alcohol, very sparingly so in ether, amyl alcohol, or carbon disulphide, and insoluble in water or light petroleum. All the solutions are neutral to litmus. The solutions of the base are almost tasteless, but those of the salts are very bitter.

Injection of skimmianine into the femoral lymphatics of *Rana esculenta* or *Rana temporaria* affects the appearance of the muscles at the place of application, and renders them stiff and brittle. The neighbouring muscles are also affected by larger doses. Voluntary motion becomes sluggish, the breathing superficial, and the pupils contract. Reflex sensibility appeared as a rule to increase only in the case of *Rana esculenta*. The absolute strength, and the work performed by the muscles, were apparently diminished. The alkaloid has probably a direct action on the muscles of the heart, decreasing the pulsations and causing disturbance of the diastole. The pulse is similarly affected, even when atropine has been previously administered. Intravenous injection, in the case of rabbits, causes general symptoms of poisoning. Slight poisoning is accompanied by feeble spasms. The pressure of the blood falls even when chloral has been administered, but after a time it increases again, probably owing to the compensating contraction of the peripheral vessels. *Skimmianine* has no effect on the secretion of urine.

(I. Honda *Chem Centr.* 1904. II., 15-11-1512)

J. Ch. S. LXXXVIII., pt II., p. 152.

It is probable that the same alkaloid is also present in the Indian species, which deserves careful examination. At my request, Mr. Satis Chandra Deb, M.A., Professor of Chemistry, Muir Central College, Allahabad, analysed the leaves of the plant, from which he obtained an alkaloid, but it was not in sufficiently large quantity to determine its nature. B.D.B.

230. *Acronychia laurifolia*, Blume. H.F.B.I., I. 498.

Vern. :—(Sinhalese) Akenda.

Habitat :—Sikkim Himalaya, in hot valleys; Khasia Mountains; Assam; Chittagong; Eastern Peninsula; Western Peninsula, on the Ghats, from Concan to Travancore. Ceylon, moist regions, from sea-level up to 5,000ft.; common in Malaya and Cochin-China.

A small tree, with pale, smooth bark; young twigs glabrous. Wood close-grained, rather hairy, yellowish white. Leaves opposite or some alternate, 3-5 in., oval or oblong-oval, acute at base, usually shortly acuminate, obtuse, entire, glabrous and shining, especially above, dark green; petioles about $\frac{1}{2}$ in. Flowers pale, yellowish green; about $\frac{3}{4}$ in., on rather long pedicels, loosely arranged in pyramidal divaricate, corymbose cymes on long, straight, axillary peduncles. Calyx-lobes short, broad; petioles $\frac{3}{8}$ in., strap-shaped, acute, inflexed at tip, hairy within the base, supersistent; stamens shorter than petals, 4, inner shorter, filament slightly dilated at base; disk tomentose, ovary tomentose, style very short; fruit nearly globular, harder in centre, but with no distinct stone, 4-celled.

Uses:—According to Dr. Trimen, the bark is used in Ceylon as an external application to sores and ulcers. The whole plant, says he, when bruised, has a warm terebinthinate scent.

The leaves have an orange-like smell when crushed, and are burnt near small-pox patients, with a view to curative effects (STEWART).

231. *Murraya Kœnigii*, Spreng, H.F.B.I., I. 503.

Syn.:—*Bergera Kœnigii*, Linn. *Roxb.* 362.

Sans.:—Surabhi-nimbu; Paribadhra.

Vern.:—Harri, Katnim (H.); Barsinga (B.); Gandla, gandi, bowala (Pb.); (Guj and Porebunder) Kadhinimb, Kadu-pab, Jhirang (Bomb.) Kadhi-nimb; Godanimb (Mar. and Bomb); Kareé-pân, Karyá-pan (Dec.); Karu-Véppilai, Karu-Vembu (Tam.); Kari-vepa-chettu (Tel.); KariVempu, Mishta-Nimb (Tam.) Karapincha (Sinhalese).

Habitat:—Along the foot of the Himalayas, from Garwhal to Sikkim, Bengal, and southward to Travancore.

A small, strong-smelling tree, deciduous in the hot season for a short time, umbrageous when in foliage, pubescent, nearly glabrous, unarmed. Bark thin grey or dark grey, with shallow netted fissures. Wood greyish white or pale brownish yellow, hard, close-grained, durable. Branches slender, young parts

pubescent. Leaves 6-12in. long, imparipinnate, somewhat crowded, spreading. Rachis pubescent. Leaflets 16-25, shortly stalked, 1-2in., oval or oblong-lanceolate, very oblique at base, slightly caudate; obtuse or emarginate, irregularly crenate, smooth above, pubescent beneath, the lower ones smaller and more rotundate. Corymbs in terminal panicles, penduncled, many-flowered; petiole about $\frac{1}{10}$ in. Flowers white, about $\frac{1}{2}$ inch, in much-branched, flattened tops; "in corymbose terminal cymes," says Trimen. Bracts minute. Sepals small, acute, triangular, pubescent. Petals linear, oblong, erect, dotted with glands, glabrous, valvate. Stamens inserted on a fleshy disk. Filaments narrowed at top, ovary glabrous, without a gynophore, 2-celled, with 1 (rarely 2) ovules in each cell. Style long, stigma large. Berry $\frac{3}{4}$ - $\frac{1}{2}$ in., nearly globular, apiculate, rough with glands, deep purple or black, when ripe, 2-seeded. The characteristic change in colour of the unripe berry from green to red, then purple, then black, when perfectly ripe, is very noteworthy.

Parts used:—The bark, root and leaves.

Uses:—The bark and root are used as stimulants by the native physicians. Externally, they are used to cure eruptions and the bites of poisonous animals. The green leaves are described to be eaten raw for the cure of dysentery; they are also bruised and applied externally to cure eruptions (Roxb). An infusion of the toasted leaves is used to stop vomiting (Ainslie). In the Punjab, the leaves are applied to bruises (Stewart). In Bombay, the leaves are given in decoction with bitters as a febrifuge (Dymock.) The plant is noticed in the Indian Pharmacopœia as having tonic and stomachic properties. The root is slightly purgative (Watt).

232. *Limonia acidissima*, Linn. H.F.B.I.,
I. 507.

Syn.:—*L. crenulata*, Roxb. 364.

Vern.:—Beli (H.); Belsion (Chutia Nagpur); Bhenta (Uriya); Keiri, Kara (Merwara); Ran limbu, naringi (Bomb.) Kawat, nai-bel (Mar.); Toralaga (Tel.); Nai-bel (Kan).

Habitat:—Dry hills in various parts of India, N.W. Himalaya; in Simla and Kumaon ascending 4,000 ft. Monghyr hills in Behar; Assam; Western Peninsula, from the Bombay Ghats and Coromandel, southward. Yunan, J. Anderson.

A spinous, glabrous shrub or small tree, with rigid flexuous, woody branches, spines $\frac{1}{2}$ -lin. Leaves pinnate, 1-4in. long; leaflets petiole and rachis jointed, the former narrowly, the latter broadly winged. Leaflets 2-4 pair, sessile, opposite, obtuse, crenulate, 1-2in., trapezoid-ovate, obtuse and notched at the tip, base cuneate, margins crenulate, nerves slender, reticulate. Racemes subumbellate, lin. long, pubescent, often leafy; pedicels slender. Flowers tetramerous, $\frac{1}{2}$ in. diam., white, fragrant. Sepals small. Petals elliptic or oblong. Disk annular or columnar. Ovary 4-celled, cells 1-ovuled. Ovule pendulous in each cell. Berry globose, $\frac{1}{3}$ in. diam., 1-4-seeded, very acid.

Parts used:—The leaves, root and fruit.

Uses:—The leaves are supposed to be a remedy for epilepsy; the root is purgative, sudorific, and employed for the cure of colic and cardialgia. The dried fruit is tonic, diminishes intestinal fermentation, has the power of resisting the contagion of small-pox, malignant and pestilent fevers, and is also considered an excellent antidote to various poisons, on which account it is much sought for, and forms an article of commerce with Arab and other merchants." (RHEEDE).

Lisboa states that the berry is much used as a tonic in Malabar, and that its red-coloured mucilage is considered to be an antidote against snake-bite and the poisons of other venomous animals.

233. *Luvanga scandens*, Ham H. F. B. I., I. 509.

Sansk.:—Lavanga-latā.

Habitat:—Eastern Bengal, Assam, the Khasia Mountains.

A strong, climbing, annual, glabrous shrub, with woody flexuous branches and strong axillary recurved spines. Leaves very variable, 3-foliate, thickly coriaceous; petioles 2-5in., stout

cylindric; leaflets quite entire, 5-12in. oblong, elliptic-oblong, lanceolate or oblanceolate, tip rounded, acute or acuminate, shortly petioled; nerves very faint, spreading. Cymes paniced or subracemose, short, shortly peduncled, few-flowered. Flowers about $\frac{3}{4}$ in. diam., very fragrant, white. Calyx cup-shaped, entire or irregularly 4-6-lobed, with the margin truncate. Petals 4, fleshy (4-5, says Brandis), recurved, imbricate. Stamens 8-10, filaments sometimes united almost to the top, subulate, inserted round a cupular disk. Ovary 2-4-celled, style stout, deciduous; ovules 2, superposed in each cell. Berry oblong, yellow when ripe, size of a pigeon's egg, rind smooth, thick, obscurely 3-lobed, pulp resinous, odoriferous. Seeds 1-3, pointed, ovoid; cotyledons fleshy, albumen O.

Use:—The berries are used in preparing a perfumed medicinal oil (Kakkolaka), and are sold in the bazaars of Bengal under the name of Kakala; they must not be confounded with Kshirakakkoli, a pseudo-bulb from Nepal, composed of from 8 to 10 ovoid fleshy scales. Kakkola and Kshirakakkoli are chiefly of interest as being the only two constituents of the Ashta-varga or 'group of eight medicines,' which are known to the modern Hindus. The Sanskrit names of the other six plants are, Rishabha, Jivaka, Meda, Mahameda, Riddhi and Vriddhi. (Pharmacographia Indica, Vol I, 268).

234. *Paramignya monophylla*, Wight., H. F. B. I.,
I. 510.

Vern.:—Kurwi Wágeti; Kari wágeti, ranyid (Bomb and Goa). Nat-Kanta (Nepal); Jhunok (Lepcha.)

Habitat:—Sikkim, Himalaya, Bhotan; Khasia Mountains; Western Peninsula; the Western Forests, from the Concan southward.

A stout, climbing, evergreen, thorny shrub. Shoots densely pubescent, the older branches, with sharp recurved axillary spines $\frac{1}{2}$ in. long. Bark white, corky, vertically cleft. Wood white, hard, close-grained. Leaves coriaceous, numerous, 2-4in.,

oval or oval-oblong, or lanceolate, rounded at base, obtuse or acute, entire or nearly so, glabrous, except the pubescent mid rib beneath; conspicuously gland-dotted. Petiole $\frac{1}{2}$ in., twisted. Flowers $\frac{3}{4}$ in., on short pubescent peduncle, 1-3 together in the axils. Calyx woolly-pubescent, lobes 5, shallow, rounded. Petals 5, oblong-linear, recurved. Filaments hairy. Ovary 5-celled. Stigma large, capitate. Berry yellow, globose, pyriform, over lin. long, smooth. Seeds several, large, compressed (Trimen).

Rather common in the low country, Ceylon; Sikkim, Bhutan Khasi Hills, Tenasserim, Western Ghats, South India. Darjeeling, N. E. Himalaya.

Trimen gives Sinhalese name:—Wellangiriya.

Part used:—The root.

Use:—In the Concan, the root is given to cattle suffering from bloody urine, or bloody fluxes from the abdomen. When on a visit to Goa, I observed that the country people made use of the root as an alterative tonic (Dymock.)

235. *P. longispina*. Hook. H. F. B. I., I. 511.

Vern:—Ban Nimbu (Sundribuns).

Habitat:—Eastern Sunderbuns, at Baniakhali (Prain) Malacca.

An erect, glabrous shrub. Branches stout; spines long, straight, below petioles, opposite and alternate, sometimes 2 in. long. Leaflets oblong, subacute, 3-4 in., base cordate. Petiole very short. Flowers $\frac{1}{4}$ in. long, solitary, small; pedicels very short. Calyx-lobes obtuse, 5. Petals $\frac{1}{2}$ in., broad, oblong, obtuse. Stamens 10, short, equal, glabrous, equalling the linear anthers. Anthers narrow, with a long apiculus. Style stout, cylindric; ovary 3-4-celled, 4-ovuled, stipitate. Fruit a berry, 3-4-angled, 1-1 $\frac{1}{4}$ in. long, between globose and ovoid; 3-4-celled. Ovules superposed in pair. Rind of fruit thick, coriaceous, glandular. Pulp O. Seeds 2-4 in each cell; oblong, compressed, narrowed at base into a short beak.

Use:—Fruit used in cases of colic Prain's (Flora of the Sunderbuns, p. 291).

236. *Atlantia monophylla*, Correa. H.F.B.I., I. 511.

Syn. :—*Limonia monophylla*, Linn. *Roxb.* 363.

Sans. :—Atavi-jambira.

Vern. :—Mákad-limbu (Mar.); Narguni (Uriya); Adavi-nimma (Tel.) Kathe-elumichcham-param, Katyalu (Tam.); Kán-nimbe, adavi-nimba (Kan.); Mal-narangá (Mal.); Jangli-nimbu (Dec.); Mátangnár (S. Konkan.)

Habitat :—Sylhet at the foot of the Khasia Mountains; throughout the Western Peninsula, from Konkan and Coromandal southwards. Ceylon, not uncommon towards the north of the Island; in dry regions common. Tamil name in Ceylon :—Perunkuruntu (Trimen).

A small tree or shrub, with numerous rigid branches, the elder ones armed with short spines, young parts glabrous. Wood very hard and heavy, close-grained, yellow. Leaves 1½-3in.; rhomboid-lanceolate, acute at base, obtuse, deeply notched at apex, glabrous, thick, veiny; petiole short, slightly pubescent, with one or two linear or setaceous, stipular scales at base. Flowers ½in., rather crowded in axillary umbels or corymbs. Pedicels ¼in., glabrous, bracts small, ciliate. Calyx glabrous, irregularly split to base. Petals white obovate-oblong, obtuse, recurved. Stamens 8; filaments completely connate into a long tube and sometimes adnate to petals at base; anthers broadly ovoid; ovary oblong, glabrous, 4-celled, style short, no gynophore. Berry globular-ovoid, ½in., with a long apiculus, 4-celled, 4-seeded.

Uses :—"The berries of this yield a warm oil which is, in native medicine, considered as a valuable application in chronic rheumatism and paralysis (AINSLIE.)

In the Concan, the leaf juice is an ingredient in a compound liniment used in hemiplegia (DYMOCK.)

237. *Citrus medica*, Linn. H.F.B.I., I. 514.

Habitat :—Valleys along the foot of the Himalaya, from Garhwal to Sikkim; the Khasia Mountains, Garrow Mountains,

Chittagong, the Western Ghats, and Satpura range in Central India.

A shrub or small tree, flowering and fruiting at most seasons growing where, says J. D. Hooker, I found it on steep hill-sides (in Sikkim). Young shoots glabrous, purple. Leaflets glabrous, 3-6in., elliptic ovate or ovate-lanceolate; petiole naked or winged. Flowers 6-10in., a raceme, small or middle-side, often unisexual. Stamens 20-40; petals generally more or less pink. Fruit globose, ovoid, or oblong, often mamillate at the apex. The stamens are 25-55, says Brandis. Brandis found it, says he, (1) apparently wild in the outer valleys of Kumaon (1875); (2) in the outer valleys of Sikkim (1879); (4) Damrahal, Garo Hills (1879), a tree of 6ft. girth, 40ft. high; (5) upper Yunzalim Valley above Lomatee, in swamps and near streams (1880). Reported to be wild in the Eastern Dun, on the Satpura Hills and the Western Ghats in the Bombay Presidency (Talbot), Chitagong and on the Khasi Hills (H. K. and W.).

Of the more cultivated forms may be mentioned the following four varieties:—

Var. I. *C. medica* proper, the Citron. Var. II. *C. Limonum*, the Lemon. Var. III. *C. Acida*, the sour lime of India. Var. IV. *C. Limetta*, the Sweet Lime of India.

Variety I. *C. Medica* proper, the Citron. *Roxb.* 590. Leaflet oblong, petiole short, margined or not, flowers usually numerous; fruit larger oblong or ovoid, or irregularly shaped, mamilla obtuse, rind usually warted, thick, tender; very aromatic, bitter, scanty subacid pulp.

Sans.:—Matulunga; phalá púra; bega púra.

Vern.:—Bijaura; limbu; Kutla; bara nimbu (H.); Beg-púra; lebu; nebu; bijaura; honsa nebu (B.); Bajauri nimbu (Pb.); Bijoru; turanj; bálank (Guz.); Bijapura; mahalunga; bijori; binu (Roxb.); Máhalung (M.); Turanj (Dec.); Elumich cham-pazham; nárttam pazham (Tam.); Nimma pandu; naradabba (Tel.); Nimbe hanu; limbu (Kan.)

Parts used:—The rind, pulp, seeds and leaves.

Uses.:—Citron rind is hot, dry, and tonic; the pulp cold and dry; the seeds, leaves and flowers hot and dry; the juice refrigerant and astringent. According to Theophrastus, the fruit is an expellent of poisons. It also corrects foetid breath (Drury.) The distilled water of the fruit is used as a sedative (Year-Book of Pharmacy, 1874, p. 623).

The rind is made into a marmalade and is an antiscorbutic. It is made into a preserve and is used for dysentery (Watt.)

Var. II. C. Limonum. The Lemon.

Vern.:—Jámbira; bará nimbú; pahári nimbu; pahari-Kaghzi (H. and Dec.); Karna nebu; gora nebu; bara nebu (B.); kimti; gulgul; khutta (Pb.); Metá limbu; mótu-limbu; Motu nimbu (Guz.); Thorla-limbu (Mar.); Periya-elumich-cham-pazham (Tam.); Pedda-nimma-pandu (Tel.); Doddá-nimbehanun (Kan.)

Habitat:—Cultivated in India.

Leaflet ovate, petiole margined or winged, fruit middle-sized, ovoid, yellow, nobbed or mamillate, rind thin, pulp abundant, very acid.

Official Parts:—1. The outer part of the rind of the ripe fruit (*Limonis Cortex*); 2. The essential oil of the rind (*Limonis Oleum*); and 3. The expressed juice of the ripe fruit (*Limonis Succus*.)

Properties of the Rind.—Stomachic and carminative.

Therapeutic Uses.—Similar to those of *Cortex Aurantii* (*ante*); it is, however, principally employed as a flavouring agent.

Oil of Lemon (*Oleum Limonis*). Obtained either by distillation or by simple expression of the finely grated rind.

It is carminative in doses of from two to four drops, but is rarely employed in this character. It forms an ingredient in *Spiritus Ammoniae Aromaticus*, and in *Linimentum Potassii Iodidi cum Sapone*. It has been used as a local application in some forms of ophthalmia, but with doubtful results. Lemon oil mixed with glycerine is applied to the eruption of acne (Watt.)

Lemon Juice (Succus Limonis).—The expressed strained juice of the ripe fruit.

Lemon juice contains citric acid, in the proportion of about 32 grains to each fluid ounce, with mucilage and extractive. To prevent its undergoing decomposition, which it is apt to do by keeping, a proportion of about 10 per cent. of spirits of wine or strong brandy may be added, and the mucilage separated by filtration. Another effectual plan is to allow the juice to stand for a short time after expression, till the coagulable matter separates, then to filter and put into bottles. with a stratum of almond or other sweet oil upon its surface.

Properties.—Valuable anti-scorbutic and refrigerant; primarily, anti-alkaline; secondarily, antacid.

Therapeutic Uses.—In scurvy, it is one of the best remedies we possess, both as a prophylactic and as a curative. In febrile and inflammatory affections, the diluted juice, sweetened, forms an excellent refrigerant drink. In acute rheumatism and rheumatic gout, in some forms of acute tropical dysentery and diarrhoea, &c., it has been successfully employed. As an antidote to some acro-narcotic poisons, it often proves effectual. Lemon juice and gun powder used topically for scabies.—*Ph. I.*

The bark of the root has been used in the West Indies as a febrifuge and the seeds as a vermifuge (WATT.)

A decoction of the lemon, reported by Dr. Aitken of Rome is said to be a very valuable remedy in the treatment of ague (B. M. J. Oct. 4, 1884).

Var. III. *C. acida*. The sour Lime of India.

According to Bonavia (Oranges and Lemons of India, p. 246), it is more probable that this has descended from *C. Hystrix* of Kurz than from the *C. medica* of Linnaeus.

For figures, see Bonavia's work Plates 238 and 239.

Syn. :—*C. acida*, Roxb. 589.,

Vern. :—Lebu; nebu; nimbu; kágugi-nebu (B.); Nimbu; khatta-nimbu (Pb.); Khata limbu (Guz.); Limbu (Mar.); Limunibu (Dec.); elu-mich-cham-pazham; elemitchum; elimichum;

elimichum pullam (Tam.); Nimma-pandu; nemmapúndú (Tel.)
Nimbe hannu (Kan.).

Habitat:—Wild in the warm valleys of the outer Himalayas. Cultivated all over India.

Leaflet elliptic-oblong, petiole many times shorter than the leaflet, linear or obovate, racemes short, flowers small, petals usually 4, fruit usually small, globose or ovoid, with a thick or thin rind, pulp pale, sharply acid.

Part used:—The juice.

Use:—Native practitioners consider lime-juice to have virtues in checking bilious vomiting, and believe that it is powerfully refrigerant and antiseptic (AINSLIE.)

Fresh lime-juice often proves effectual in relieving the irritation and swelling caused by mosquito-bites (Dr. Thornton in Watt's Dictionary.)

Var. IV. *C. limetta*, D.C. H.F.B.I., I. 515.

Sans.:—Madhu Karkatikā.

Vern.:—Mitha nebu; nembu; mitha amritphal (H.); Mitha nebu (B.); Mitha-nimbu (Pb.); Mitha limbu (Guz.); elemiteuhm (Tam.); Nemma-pandu; gajanimma (Tel.). Erúmitchi narracum (Mal.). Sâkar-Nimbu (Marathi; Bombay).

Habitat:—Cultivated in most parts of India.

Leaves and flowers as in Var. *acida*; fruit globose, 3-5 in. diam., rind very thin, smooth, adherent to the pulp. Flowers pure white, at times tinged pink. The pulp is never acid, even in early stages of the fruit. Juice sweet, abundant, refreshing, "not aromatic," say Brandis and Hooker. I find it slightly aromatic with the faint flavour of the rose as grown in the Bombay and Dekkan gardens. (K. R. K.).

Use:—Extensively used as refrigerant in fever and jaundice (WATT).

238. *C. aurantium*, Linn. H.F.B.I., I. 515.

Habitat:—Hot valleys along the foot of the Himalaya and from Garwhal eastwards to Sikkim and in the Khasia Mountains; Manipur; mountain forests in the Peninsula.

An arboreous, rarely shrubby, small, slender tree; young shoots glabrous, greenish-white. Leaves glabrous, 3-6in., elliptic or ovate, acuminate; petioles naked or winged; wings often obovate, as large as the blade or nearly so. Flowers pure white, scented more or less; bisexual. Stamens 15-30. Fruit globose, often depressed, 2in. diam., generally oblate, not mammillate.

Of the more commonly cultivated forms are:—

Var. I. *Aurantium proper*. *C. Aurantium*, Linn. H.F.B.I., i. 515; *Roxb.* 590. The Sweet Orange. Petiole naked or winged, pulp sweet, rind yellow, rarely red in India.

Sans.:—Nágaranga.

Vern.:—Nárángi; Santará (H.); Kamalá nebu; nárángi (B.); Suntala (Uriya); Nárángi (Guz. and Mar); Kichilli; chechu; collungie pullam (Tam.); Ganjanimma; naranga pandu (Tel.); Kithaboippe (Kan.); Máhura-naranna (Mal.)

Habitat:—Cultivated in India.

Parts used:—The rind and flowers.

Uses:—The dried outer portion of the rind of the fruit possesses stomachic and tonic properties. It is useful in atonic dyspepsia, and general debility. * * The water distilled from orange flowers is employed, in one or two fluid ounces, as an antispasmodic and sedative in nervous and hysterical cases (Ph. Ind.)

The Mahomedan writers describe the rind and flowers as hot and dry, the pulp cold and dry, and recommend the fruit in colds and coughs, when febrile symptoms are present. The juice is valuable in bilious affections, and stops bilious diarrhoea. * * The peel is useful for checking vomiting, and the prevention of intestinal worms. Orange poultice is recommended in some skin affections, such as psoriasis, &c. Oranges are considered to be alexipharmic and disinfectant; orange-water stimulating and refreshing. The essence is extracted by oil from the rind and flowers, and is used as a stimulating liniment (DYMCK.)

"The fresh rind of the fruit is rubbed on the face by people suffering from acne" (Dr. Gray). "If the rind be mixed with a little water, and then rubbed on a part affected with eczema, much relief will be derived" (Dr. Wilson)—Watt's Dictionary.

Var. II *C. Bigaradia*, Brandis. (The bitter or Saville orange). Petiole usually winged, flowers larger and more strongly scented, rind very aromatic, pulp bitter.

The Bitter or Seville Orange. Does not seem to be cultivated in India, except in gardens.

Var. III. *C. Bergamia*.

The Bergamotte Orange.

Sans.:—Jambira-phalam.

Vern.:—Limun; nibu (H.); Nebu (B.) elumich-cham-pazham (Tam.); Nimma-pandu (Tel.); Cheru-narnna (Kan.).

Habitat:—Rarely cultivated in India.

Flowers small, very sweet-scented, fruit globose or pyriform, pleasant aroma.

Part used:—The juice.

Use:—The juice of the fruit possesses properties similar to those of lemon juice. It is often preferred to lemon juice, as the fresh juice can be readily obtained in all parts of the tropics, and as the preserved lemon juice is less effectual. It is useful as a refrigerant drink in small-pox, measles, scarlatina and other forms of fever. It may also be taken with advantage in cases of hæmorrhage from the lungs, stomach, bowels, uterus, kidneys, and other internal organs (Waring's Bazaar Medicines).

Note.—In the common sweet orange, the skin, peel or rind lightly adheres to the pulp. The Nagpur *Santra* is characteristically loose-skinned. It is grown in many places in Bombay, Poona, Aurangabad, throughout India and Burma; on a large scale in the valley above Chelu, below Cherra Punji, and at other places on the south of the Khasi Hills, where the fruit ripens in autumn.

In Nagpur, the santras yield two crops in the year, the first crop from November to January, and the second in March and April (Brandis).

239.—*C. decumana*, Linn. H.F.B.I., I. 516.

The Pomelo or Shaddock-Pumel.

Vern.:—Mahánibu; chakótrá; bátávi nebu; Sadáphal (H.); Bátávi nebu; mahá nembu; chakotrá; bator-nebú (B.); chakotra (Pb.); Bijoro (Sind.); Oba Kotru (Guz); Panas Popnas (Bomb.), Pappassa; 6 pappanassa (Mar.); Bombalinas (Tam.); Edapandu (Tel.); Sakotra hannu (Kan.).

Habitat:—Cultivated in India.

An evergreen tree, 30-40ft. The trees very seldom reach higher than 10ft. in Bombay as grafts from "Goti." Bark thick; young shoots pubescent. Leaflets large, ovate-oblong, 6-9in., frequently emarginate, pubescent beneath, petiole broadly winged. Flowers large, white, highly odorous, the scent most delicate and delicious forming the "Neroli Water" very largely used by the European Jews of Bombay and obtained from Asiatic Turkey, probably Baghdad or Basorah. Stamens 16-24. Fruit often very large, even larger than a man's head; pale yellow when ripe, with juicy vesicles pink or crimson or pale rosy inside, in great abundance in each carpel, sweet or acid, slightly bitter in some varieties. Vesicle of pulp distinct. The vesicular pulp is not by any means *acid*, as Hooker remarks, but *acid*. The rind of the fruit is spongy, and the epicarp of it aromatic; it is used by some Europeans in Bombay for making "Bitters," like Angustura bitters for mixing drops of it with sherry as a drink before dinner (K. R. K.).

Parts used:—The fruit and leaves.

Use:—The fruit is nutritive and refrigerant. It contains sugar and citric acid, with much essential oil in the peel. The leaves are said to be useful in epilepsy, chorea and convulsive cough (Punjab Products).

In Brazil, "a gum which exudes in quantity from this tree when it begins to decay, probably in consequence of the attack

of insects, is used as a remedy for coughs. Ph. J. 27th December, 1884.

240. *Feronia elephantum*, Correa, H.F.B.I.,
1. 516, Roxb.

Sans. :—Kapitha, kapi-priya.

Vern. :—Kaith-bilin, kat-bel, kavitha (H.); Kath-bel (B.); Kainta, kouch-bel (Santal.); Koeta (Uriya); Katori, kavatha (Sind.); Kawat, kavith (Mar.); Kotha, kavith (Guz.); Vilâm, vallanga, velâ, kavith, kaist (Tam.); Velagâ, elaka, yellanga, kapitir (Tel.); Bilwar, byala da nannu, belada, bel (Kan.); Vilam (Mal.); Diwal (Sinhalese); Vila, villâte, Meladik-kuruntu (Tamil) Ceylon.

Habitat :—Throughout India in dry situations Java and Ceylon, very common in the dry region.

A large glabrous, deciduous tree, armed with strong straight axillary thorns. Bark dark or nearly black. Wood yellowish or greenish-white, hard; pores small or moderate-sized, ringed, subdivided or in small patches, often filled with resin. Medullary rays short, white, prominent, moderately broad. Annual rings marked by a white line, and the fewer pores of the autumn wood (Gamble). The tree yields a gum similar to gum arabic. Leaves alternate, imparipinnate; leaflets opposite 1-4 pair, cuneate or obovate, crenate at tip; common petiole often narrow winged. Flowers dull red, generally unisexual, in lax panicles, male and bisexual flowers frequently on the same inflorescence. Stamens 10-12, filaments short, subulate, from a broad villous base. Fruit globose, gray, covered with brownish fluff, in small chaff-like pieces, rough, 2-3 in. diam. (often more especially in the Ceylon fruit upto 4 in. K. R. K.), rind hard, woody. Seeds numerous, oblong, embedded in fleshy edible acid, aromatic pulp. Flowers (from February to April), pale green, stained with red purple. Anthers dark red.

Parts used :—The fruit, gum, leaves, bark and pulp.

Uses :—The fruit is aromatic and used as a stomachic and stimulant in diseases of children. The gum, resembling gum-arabic, acts as a demulcent in bowel affections. "The unripe

fruit is described as astringent, and is used in combination with *bela* and other medicines in diarrhœa and dysentery. The ripe fruit is said to be useful in hiccup and affections of the throat. The leaves are aromatic and carminative" (U. C. Dutt).

In Mahomedan medical works the leaves are described as astringent, the fruit as "cold and dry, refreshing, astringent, cordial, and tonic, a useful remedy in salivation and sore throat, strengthening the gums and acting as an astringent. Sherbet made from the fruit increases the appetite, and has alexipharmic properties. The pulp, applied externally, is a remedy for the bites of venomous insects; if not obtainable, the powdered rind may be used" (Dymock.)

Is sometimes used to adulterate Bael fruit.

"The leaves are aromatic and carminative, and have the odour of anise; prescribed by native practitioners in the indigestions and slight bowel affections of children" (Ainslie.)

"The bark is said to be sometimes prescribed for biliousness" (Watt).

241. *Ægle Marmelos*, Correa, H.F.B.I., I. 516
Roxb. 428.

Sans. :—Bilva.

Vern. :—Bel, sriphal (H.); Bel (B.); Bil, bel (Mar. & Guz.); Bila, katori (Sind.); Lohagasi (Kol.); Awretpang (Magh.); Vilva-pazham, Vilvam Tamil; (Sinhalese); Beli (Tam.); Maredu, maluramu, bilva-pandu, patir (Tel.); Maika, mahaka (Gond.); Kúvalap-pazham (Mal.); Bilapatri (Kan.)

Habitat. :—Sub-Himalayan forests, from the Jhelum eastward, Central and South India. Ceylon (cultivated.)

A large or middle-sized tree, deciduous, glabrous, armed with axillary, straight, sharp, spines lin. long. Branches spiny. "Bark, $\frac{1}{2}$ in. thick, outer substance soft, grey, exfoliating in irregular flakes. Wood yellowish white, or greyish-white, hard, with a strong aromatic scent when fresh cut; no heartwood.

Pores small, ringed, in small groups of two or three together, sometimes, but not always, more numerous, in the Autumn wood. Medullary rays wavy, fine, short, white, numerous, uniform and equidistant. Annual rings marked by distant lines, and often by a continuous belt of pores (Gamble.) Leaves alternate, trifoliate. Leaflets 3 generally, sometimes 5; ovate-lanceolate, crenate, lateral sessile, terminal, long-petioled. Flowers 1½ in. diam., bisexual, 4 5-merous, greenish-white, in short lateral panicles, with a fine, sweet, honey scent. Pedicels and Calyx pubescent. Calyx flat, teeth small; Petals imbricate; Stamens numerous, filaments short, sometimes fascicled (J. D. Hooker), anthers linear (Brandis.) Fruit 4-6 in. diam., globose mostly; rind smooth grey or yellow. J. D. Hooker says the fruit is oblong to pyriform. The tree is very common in Western India. I have not seen the fruit in any of the two latter shapes (K. R. Kirtikar.) Seeds numerous, oblong, flat; testa densely clothed with thick fibrous hairs, in a thick orange-coloured, sweet, aromatic, gelatinous pulp.

Parts used :—The fruit (both ripe and unripe), root bark, leaves, rind of the ripe fruit and flowers.

Uses :—In medicine it is used in various ways :—

(a) The unripe fruit is cut up and sun-dried, and in this form is sold in the bazaars in dried whole or broken slices. It is regarded as astringent, digestive and stomachic, and is prescribed in diarrhoea and dysentery, often proving effectual in chronic cases, after all other medicines have failed. It seems especially useful in chronic diarrhoea; a simple change of the hours of meals and an alteration in the ordinary diet, combined with bael fruit, will almost universally succeed.

The value of the fruit as a cure for dysentery is when it is unripe. (K. R. Kirtikar.)

(b) The ripe fruit is sweet, aromatic and cooling; and, made into a morning sherbet, cooled with ice, is pleasantly laxative and a good simple cure for dyspepsia. The dried ripe pulp is astringent and used in dysentery.

(c) The root bark is sometimes made into a decoction and

used in the cure of intermittent fever. It constitutes an ingredient in the *dasamul* or ten roots. "Used on the Malabar Coast in hypochondriasis, melancholia, and palpitation of the heart." (Rheede.)

(d) The leaves are made into poultice, used in the treatment of ophthalmia, and the fresh juice diluted is praised in catarrhs and feverishness.

(e) The astringent rind of the ripe fruit is used in dyeing and tanning. It is also sometimes used medicinally.

The expressed juice of the leaves is used in ophthalmia and other eye affections. In Malabar a decoction of the leaves is valued in asthmatic complaints. A hot poultice to the head is used in delirium of fevers.

A water, distilled from the flowers, is said to be alexipharmic.

A decoction of the root of *Ægle Marmelos* is given with sugar and fried rice for checking diarrhoea and gastric irritability in infants.

"The fresh juice of the leaves is given, with the addition of black pepper, in anasarca, with costiveness and jaundice. In external inflammations, the juice of the leaves is given internally to remove the supposed derangement of humours" (U. K. Dutt).

"The Mahomedans consider the ripe fruit to be hot and dry, the very young fruit to be cold in the second degree, and the half-ripe fruit cold in the first and dry in the second degree; its properties are described in the *Makhzan-el-Adwiya* as cardiacal, restorative, tonic and astringent; it is directed to be combined with sugar for administration to prevent its giving rise to piles. * * * In the Concan the small unripe fruit is given with fennel seeds and ginger, in decoction, for piles. * * * Two tolas of the juice of the bark is given with a little cummin in milk as a remedy for poverty of the seminal fluid" (Dymock).

"The pulp of the unripe fruit is soaked in gingelly oil for a week, and this oil, smeared over the body before bathing, to

remove the peculiar burning sensation in the soles of the feet, so common amongst natives" (Dr. John Lancaster.)

"Used in chronic gonorrhœa, when the pulp of the fresh fruit is mixed with milk and administered with cubeb powder. Supposed to act as diuretic and astringent on the mucous membranes of the generative organs" (Dr. Fitzpatrick.)

"The leaves are very efficacious when pounded into a pulp without any admixture of water, and applied cold in the form of a poultice to unhealthy ulcers" (Asst.-Surgeon A. C. Mukerji.)

"The fresh juice of the leaves acts as a mild laxative in cases of fever and catarrh, and has probably the effect of remedying these conditions" (Asst.-Surgeon Doyal Ch. Shome).

"The decoction of the leaves is used as a febrifuge and expectorant" (Asst.-Surgn.—N. L. Ghose.)

"The juice of the fresh leaves has a laxative action." (Surgn. K. D. Ghose.)

"The root is said to be an antidote against poisonous snakebite." (Surgn. Meadows.) *Watt's Dictionary*.

In the *Pharmacopœia of India*, the half-ripe fruit is officinal.

The value of Bael in intestinal affections, though noticed by Rheede (*Hort. Malab.*, vol. iii., p. 37), Burman (*Flor. Ind.* Ed. 1768, p. 109), and other old writers, attracted little notice till 1853, when Sir Ranald Martin (*Lancet*, 1853, vol. ii., p. 53) called the attention of the profession to it. Dr. J. Shortt and Dr. J. Newton, as the result of their respective personal experience, report very favourably of its action in dysentery. According to Dr. J. A. Green, a sherbet of the ripe fruit, taken every morning, proves serviceable in the dyspepsia of Europeans, when accompanied by obstinate constipation and flatulence. He adds that the unripe fruit baked for six hours is a powerful astringent, and as such is used by the natives in dysentery. Dr. B. Bose advocates the daily use of a sherbet of this fruit during cholera epidemics as a prophylactic. At such seasons it is doubtless of service to regulate the bowels carefully, avoiding either constipation or purgation. Dr. G. Bidie (*Madras Quart.*

Journ. of Med., 1862, vol. v., p. 44) states that the fruit of *Feronia elephantum*, or Wood-apple, which bears a general resemblance to Bael, is often substituted for it in hospital supplies, and being comparatively useless has induced many to treat the Bael with neglect. The fullest account of its properties and uses is by Dr. A. Grant (*Indian Ann. of Med. Sci.* 1854, vol. ii., p. 224)—*Ph. Ind.*

“*Physiological Actions.*—The pulp is stimulant, stomachic, antipyretic, antiscorbutic, and possesses a beneficial influence over the mucous membrane of the alimentary canal.”

“*Therapeutic Uses.*—The pulp of the fruit has proved very useful in my hands in dysentery, diarrhœa, aphthæ, land-scurvy and some continued fevers. I have generally used it in the forms of powder and syrup. The pulp of the ripe fruit is more suited for the syrup, and that of the half-ripe for the powder. The powder, again, is more useful in acute diseases, and the syrup in the chronic. In acute dysentery, the powder is required to be employed in much larger doses than in any other disease. The first good effect of the powder in acute dysentery is generally the disappearance of blood and a proportionate increase of the fæculent matter in evacuations. In fact, the powder seems to have more power in altering the nature of the dysenteric motions than in reducing their number. To check the frequency of evacuations, the powder generally requires the combination of opiates or some other astringent medicines. The powder and syrup, particularly the former, are also very useful in relieving the febrile condition in some forms of continued fever, including the hectic and typhoid. The abnormal temperature is reduced under its use in a remarkable manner and deserves particular attention.

“*Preparations.*—Powder and Syrup.—Powder: The pulp being first prepared and dried in the manner described below, is reduced to a fine powder in the usual way and kept in a closed vessel. Syrup: Take of the dry pulp, five ounces; soak it in two pints of water for a few hours or till it becomes soft; rub it well with the hand and strain the liquid through cloth up to one pint; add to the latter fifteen ounces of refined

sugar, and heat it till it acquires the consistency of a thick syrup. When the syrup is prepared from the pulp of the large or cultivated variety of bael-fruit, the quantity of sugar required is only ten ounces.

“*Doses.*—Of the powder, as a remedy in dysentery, from twenty to forty-five grains; and for all other purposes, from ten to twenty grains; four, five or six times in the twenty-four hours. Of the syrup, from four fluid drachms to one fluid ounce every third or fourth hour. The small or common variety of bael fruit being, as a medicine, stronger than the larger or cultivated variety, the dose of its powder should always be less than that of the latter by one-third.

“*Remarks.*—There are two varieties of *Ægle Marmelos*, the small or common, and the large or cultivated. There is no distinct difference between the medical properties of both varieties, except that the fruit of the small or common variety, which is described in every botanical work in this country, is much stronger, as a drug, than that of the large or cultivated variety. The large or cultivated variety differs from the small or common one in the following points:—

“Generally free from spines; leaflets broadly and abruptly acuminate, instead of oblong or broadly lanceolate, and when bruised, have an agreeable and aromatic odor; fruit eatable and delicious when quite ripe, almost invariably globular, generally two or three times larger than that of the small or common variety, and sometimes attains the size of a small child's head.

“The pulp of the ripe and half-ripe fruit of both varieties is the best and most useful part of the plant for medicinal purposes. The pulp should be removed from the rind before the fruit is dry, cut into small pieces and dried in the sun. The pulp of the ripe fruit of the large variety is, first, of flesh color, but gradually becomes dark-brown; it has an agreeable and aromatic odour and a terebinthinate and sweetish taste. It is not destroyed by keeping. However old it may be, if soaked in water for some hours, it becomes as soft as it is when fresh, and still retains its characteristic smell and taste.

"From its greater abundance and cheapness, the Wood-apple (*Feronia elephantum*) is occasionally substituted for the Bael-fruit in the bazaar when the latter is sold in large quantities, but there will be no difficulty in distinguishing them from each other, if the following distinctions be attended to :—

Bael-fruit of both varieties.

1. Generally roundish, ovoid or obovate, and sometimes oblong.
2. Generally about the size of a large orange, often as big as a large pomegranate, and sometimes attains the size of a small child's head.
3. Greenish or yellowish brown in color, smooth and slightly shining.
4. Rind very hard, woody and thin.
5. In the centre of the pulp there are from five to eighteen small cells, each of which contains some mucus, and from one to twelve or more seeds. (In the small variety of bael-fruit, the seeds are often absent in some cells.)
6. The seeds are oblong, flat or compressed, woolly, and about the size of a lime-seed.
7. The mucus is thick, very tenacious, transparent, and strongly terrobinthinate in smell and taste.
8. When the fruit is quite ripe, the pulp is of a brownishred or reddish yellow color, with a strong balsamic odour and sweetish taste.

(Moodeen Sheriff.)

Wood-apple.

1. Almost always round or spherical.
2. Generally about the size of an orange, and often as large as a pomegranate.
3. Greenish white or ash colored, neither smooth nor shining.
4. Rind hard, woody, and though somewhat thicker, yet more easily broken.
5. No cells at all, and the seeds are numerous and embedded in the pulp. A fruit contains about 500 seeds.
6. The seeds are generally about the same shape, but one-half smaller in size.
7. Contains no mucus, but is acid from the presence of citric acid.
8. In the same condition, the pulp is of a reddish grey or flesh color, with a very agreeable and slightly aromatic odor and sub-acid taste"

N. O. SIMARUBEÆ.

243. *Ailanthus glandulosa*, Desf.; H.F.B.I., I. 518.

Eng. Syn. :—Japan Varnish Tree.

Habitat :—Northern India.

A lofty tree; leaves pubescent or sub-glabrous; leaflets very coarsely toothed at base, very numerous, divided very unequally

by the midrib, paler beneath. Flowers small, in much-branched panicles. Filaments elongate, filiform, exserted, several times exceeding the anther. Fruit about 3 membranous, linear-oblong samaras, about $1\frac{1}{4}$ by $\frac{1}{8}$ in. Seed near the centre of the samara, about $\frac{1}{4}$ by $\frac{1}{16}$ in.

Part used:—The bark.

Medicinal uses:—According to Professor Hetet, the bark is an active vermifuge; in powder it has a strong, narcotic, nauseating odour. It exerts a powerful, depressing influence over the nervous system similar to that of tobacco.

Leaves used as an astringent in China.—(*Ph. J.*, 20th, December 1884.)

Useful in dysentery.—(*I. M. G.*, March 1877, p. 83.)

It contains *ellagic acid*, and a colouring matter, *quercetin* ($C_{15}H_{10}O_7$). On fusion with alkali, *protocatechuic acid* (m. p. 194-196°) and *phloroglucinol* (m. p. 210°) were identified as the principal products of the decomposition of *quercetin*.

The aqueous filtrate from the quercetin was found to contain a large quantity of *gallic acid*. The tannin of the *Ailanthus glandulosa* is evidently gallo-tannic acid.

A tannin analysis gave the following result:—

Tanning matter ...	...	...	11.2 p. c.
Soluble non-tannins ...	...	...	20.4 "
Insoluble at 60° F ...	...	...	60.0 "
Water ...	...	...	8.4
Total ...			100.0

J. Ch. S. T. 1898, p. 381.

244.—*A. excelsa*, *Roxb.* H.F.B.I. I. 518.

Sans.:—Mâdalâ, Aralu. Atarusha.

Vern.:—Maharukha, mahârukha, limbado (Hind.); Adulsa, Adusa, Maharuka, Mahânimb (Mar.); Mahanim, mâhala, gormikawat (Uriya); Ghorkaram (Palamow); Moto aduso (Guz.); Varul, mahârukh (Dec.); Arua (N.-W. P. and Mewar); Peru, pee, perumaruthâ (Tam.); Pedu, pey, pedda, peddâ-mânu putta (Tel.); Perumarum (Mal.)

Habitat:—Common in the North-Western Provinces, Behar,

the Western Peninsula, and the Carnatic, in the Bombay Presidency, widely distributed over the Thâna, Kaira, Panch Mahals and Guzerat districts, occasionally met with in Rajputana, common on the Coromandel Coast.

A tree 60-80ft. Leaves 1ft. or more, glandular-hairy; leaflets very numerous, very coarsely toothed, on long petioles, very unequal at base. Flowers larger than in *A. glandulosa*, on longish pedicels, in large lax often on very much branched, panicles. Petals ovate-lanceolate, commonly reflexed. Filaments short, half the length of anthers. Samara large copper-red longer than in *A. glandulosa*, 2in. by $\frac{1}{4}$ in., strongly veined, blunt or pointed at both ends, always once or twice twisted at base.

Parts used:—The bark and leaves.

Medicinal uses:—The bark is aromatic and used for dyspeptic complaints. It is also regarded as a tonic and febrifuge in cases of debility. Expectorant and anti-spasmodic, given in chronic bronchitis and asthma.

"In Bombay the bark and leaves are in great repute as a tonic, especially in debility after child-birth. In the Concan the juice of the leaves is usually administered in *khir*, or the juice of the fresh bark is given with cocoanut juice and treacle, or with aromatics and honey; it is said to stop after-pains" (Dymock.)

Used also as an astringent in diarrhœa and dysentery.

"Mr. Narayan Daji separated an acid principle which he named *Ailanthic acid*. This acid may be given in doses of 1 to 3 grains, and is said to be tonic, and alterative. In large doses, it causes nausea and vomiting, and is purgative. He recommended its use in dyspepsia with constipation" (G. Bidie.)

Its bark is used as a febrifuge and tonic. Narain Daji isolated from it an acid principle which he named ailanthic acid. He also found a bitter, non-crystallisable principle. It belongs to a neutral class of substances related to quassin, and may probably prove to be identical with cedrin and samaderin, which have been obtained from other members of the *Simarubaceæ*.

J. Ch. Industry, 1895, p. 985.

245.—*A. malabarica*, D. C. H.F.B.I., I. 518.

Vern. of the resin:—Mudde-dhûpa, bâgâ-dhupa (Bom.); Peru, peru-marattup-pattai, maddi-pâl (Tam.); Perumarum, peddamânu-patta, maddi-palu (Tel.); Mattip-pâl (Mâl.); Gugguladhûp, ud (Mar.); Dhûp, бага-dhûp (Kan.); Ladan (Dec.) Kumbalu, Walbilin (Sin.)

Habitat:—Western Peninsula, in Canara. Ceylon low country of the moist regions. Cochin China.

A lofty tree, with straight trunk and rough bark; branchlets, with large closely placed leaf-scars. Young parts pubescent, with fine simple stellate hairs. Wood very light soft spongy. Leaves very large, 1½-2ft., crowded, spreading, pinnate; rachis cylindric, with a raised line along upper side, very finely stellate-pubescent, much thickened at base; leaflets 16-20, distant, opposite or sub-opposite, shortly stalked, 3-5in., ovate-oblong, tapering, acute, unequal at base, with upper half larger and rounded, and lower half acute, entire, margin slightly reflexed, glabrous, glaucous beneath, rather thick. Flowers white, small; the bisexual, rather larger than the male, numerous, pedicellate, in long, loose, stalked, axillary panicles. Calyx small, hairy, segments acute. Stamens exceeding petals. Ovary ovoid, glabrous. Samara 2½-3in., flat, oblong, obtuse at both ends, papery, glabrous, with the seed about the middle. Seed much compressed, circular.

Trimen says: "The bark is tonic and febrifuge. A brown, fragrant, resinous exudation is given by the inner bark, and is used in Dysentery as well as material for incense."

Parts used:—The bark, fruit and gum.

Uses:—The bark is given in dyspepsia, and is also considered a valuable tonic and febrifuge. It yields a fragrant resin, which, reduced to powder, mixed with milk and strained, is given in small doses in dysentery, and also in bronchitis, and is reputed to be an excellent remedy, chiefly owing to its balsamic properties. "The fruit, triturated with mango, and mixed with rice, is reckoned useful in cases of ophthalmia, and the juice of the fresh bark, in 1 ounce doses with an equal

quantity of curds, is said to be a valuable remedy in dysentery" (Dymock.)

"The resin is terebinthinate-stimulant, its action being chiefly directed to the mucous surface of the genito-urinary organs and of the large and small intestines; and the bark is tonic and demulcent.

"The resin, particularly its first or soft variety, possesses a great control over acute dysentery and diarrhœa. In gonorrhœa, gleet, chronic bronchitis and cystitis also it proves very useful and exercises a distinct beneficial influence. As a tonic, the bark resembles calumba and quassia, and like them it is administered with the preparations of iron, since it contains no tannin and is devoid of astringency.

"*Remarks.*—There are three varieties of the resin of *A. malabarica*, which, for the sake of convenience, may be called the first or soft, the second or flat, and the third or hard. The resin of the first variety is collected in bamboo-joints, one of which I have received from the Annamullay forests in the Coimbatore district. This variety is never found in the bazaars of Madras or any other place, as far as my knowledge extends, but is occasionally supplied by special request to exhibitions and to medical men requiring to examine or use it, by the Forest Department. When new, the resin in this variety is grey, very soft, viscid, plastic, opaque, and bears a great resemblance in its appearance to the *birdlime* prepared from the milky juice of *Ficus glomerata*. It retains its grey color internally for a long time, but every part of it which comes in contact with the atmosphere becomes reddish-brown in a few hours and then deep-brown. The resin has an agreeable aromatic or balsamic odour, and though it is not soluble in saliva, it produces a terebinthinate taste in the mouth when chewed. The resin is neither soluble nor miscible in cold or hot water. It is, however, miscible with the aid of rubbing and grinding in alcohol, ether and many fixed and essential oils, as cocoanut, olive, turpentine, cajuput, anise, &c. After the lapse of some months, the resin, if exposed to the air, becomes much harder and feels as tough as wax; and after a few months more, it is

as hard as a stick. The second or flat variety is extremely rare and occurs in flat and circular pipes, varying in diameter from two to three inches, and in thickness from $\frac{1}{4}$ to $\frac{1}{2}$ inch. The pieces are more or less soft like the first variety in all other characters.

"The third or hard variety (No. 159), which is by far the most common, occurs in small balls generally about the size of a small orange. The balls are very hard, smooth, dark-brown in color, both externally and internally, and possess the same kind of smell and taste, but in a much slighter degree. It contains a great deal of impurities (about 80 per cent.) as earth, sand, fragments of wood, &c., upon which its hardness chiefly depends.

"With regard to the therapeutic use of the resin of *A. malabarica*, its first variety, if fresh, has a very remarkable control over dysentery and diarrhœa, as though it possesses some specific action over the mucous coat of the large and small intestines, and therefore deserves some special attention of the profession. In some ordinary cases of acute dysentery and diarrhœa, two or three doses of the resin, in the form of emulsion, with the mucilage of gum acacia, and with from 5 to 10 minims of *Tinctura opii* in each dose, were sufficient to nip the diseases in the bud. There were no more motions, tormina or tenesmus after the second or third dose for 10 or 12 hours, and when the bowels did begin to move again after this period, the evacuations were always healthier and soon became natural without further treatment. In more severe cases, however, the medicine had to be repeated three or four times in the 24 hours and continued for two or three days before the cure was effected. In still more severe or serious and complicated cases, it was necessary to resort to some other medicines, including astringent enemata, &c., to assist the resin according to the condition and symptoms of each individual case. *Matti-pal* is also useful in gonorrhœa and gleet, and to the same extent as the Copaiba and Gurjun-balsam" (Moodeen Sheriff.)

246.—*Samadera indica*, Gært. H.F.B.I., I. 519.

Vern :—Karinghota (Mal.); Niepa (Tam.); Samadara (Sin.).

Habitat :—Western Peninsula, throughout the South Concan and Malabar. Moist low country. Ceylon.

A small glabrous tree, 30-35ft., with stout branches. "Bark pale, transversely cracked. Wood light yellow, soft, no heart-wood. Pores small, very scanty. Medullary rays very fine, uniform, closely-packed" (Gamble). Leaves simple, 8 by 3in. or larger, blunt, with short thick petioles, coriaceous, elliptic—oblong, shining, quite entire. Flowers numerous, bisexual, 4-merous, pinkish yellow, in dense pedunculate umbels, short-stalked. Calyx small, thick, ciliated, persistent in fruit. Petals narrowly oblong, often spiculate, $\frac{3}{4}$ -1in. long. Stamens twice as many as petals; filaments, with a small hairy scale at base, very long. Ovary on a gynophore, usually deeply lobed. Fruit oval, $1\frac{1}{2}$ in. by 1in. (Bennett), of one carpel, thickly coriaceous, shining, compressed, keeled, 2 by $1\frac{1}{2}$ in. (Brandis.)

Parts used :—The bark, leaves, seeds and oil.

Use :—"The bark is used by the natives as a febrifuge. An oil extracted from the kernels of the fruit forms a good application in rheumatism. The bruised leaves are externally applied in erysipelas. The seeds are worn round the neck as a preventive of asthma and chest affections. An infusion of the wood is also taken as a general tonic" (Rheede and Drury).

The root is used medicinally by the Singhalese. An infusion of leaves is a good insecticide and destructive to white ants (Trimen.)

"An infusion of the wood is taken as a general tonic. This drug may well be used as a substitute for quassia" (Dymock).

From the seeds were obtained :—(1) A fatty oil, forming 63 p. c. of the whole, and consisting of triolein 88, tripalmitin 8, and tristearin 4 p. c.; (2) a proteid, soluble in alcohol and in water, and containing 18 p. c. of nitrogen; (3) sucrose; (4) a sugar that reduces Fehling's solution directly; (5) inositol; (6) a crystalline bitter substance.

From the bark :—(1) The same bitter substance as from the seeds; (2) a crystalline bitter substance crystallising in yellow plates, probably an anthraquinone derivative; (3) a tannic acid belonging to the group of phloroglucotannoids; (4) ellagic tannic acid; (5) a tannic acid closely resembling tannin; (6) a large amount of inorganic salts.

From the wood :—(1) A bitter substance crystallising in yellow, rhombic prisms; (2) a bitter substance very closely allied to quassin.

The bitter substance that occurs in both seeds and barks crystallises in monoclinic plates, melts at 255° and decomposes at 260° , and has $n_{\text{D}}^{20} 1.624$ and $[\alpha]_{\text{D}}^{20} +250.2$. It contains no water of crystallisation, and has the composition $\text{C}_{29}\text{H}_{34}\text{O}_{11}$. With phenylhydrazine, it yields a yellowish, crystalline substance, melting at 214° ; no methoxyl or ethoxyl group is present. It gives a violet coloration with strong sulphuric acid, and has a poisonous action on frogs, less so on guinea pigs and rabbits. Most probably it is identical with the samaderin of Rost Van Tonningen. (By J. L. Van Der Marek, *Arch. Pharm.* 1901, 239, 96-113.) *J. Ch. S.* LXXX, pt. II, p. 334.

The seeds of *Samadera Indica* contain 63 p. c. of fat, which consists of 87.7 p. c. of triolein, 8.41 of tripalmitin, and 3.89 of tristearin. The alcoholic extract contains an alkaloid which appears to be identical with gliadine and a resin; glucosides and a bitter principle are present in the seeds. The bitter principle is also contained in the bast and is accompanied by tannic acid; it is somewhat soluble in alcohol and acetone, melts at 255° , and is apparently identical with Rost Van Tonningen's samaderin. It contains carboxyl groups, but neither a methoxy, nor an ethoxy-group, and, when administered to cold-blooded animals, causes paralysis of the voluntary nerves and death.

A second bitter principle is found in the roots; it melts at 209° , is soluble in alcohol and sodium hydroxide solution, and is apparently identical with quassin.

J. Ch. S. Vol. LXXX, pt. II, p. 71.

247.—*S. lucida*, Wall. *H. F. B. I.*, I. 519.

Vern. :—Ka-thay (Burm.)

Habitat :—Burma and Andaman Islands.

Very nearly allied to *S. indica*, and perhaps only a variety. Leaves a paler green, sometimes larger, with longer petioles. Peduncles of umbels shorter than the leaves. Umbels sometimes almost sessile. Fruit strongly reticulated, smaller, pear-shaped, dark brown, glabrous, with a narrow wing.

Use :—The leaves are intensely bitter and taste like quassia.

248.—*Picrasma quassioides*, Benn. *H. F. B. I.*, I. 520.

Syn. :—Simaba quassioides, Ham. Nima quassioides, Ham. mss.

Vern. :—Bharangi or baringi (H.); Puthorin, bera, mâthu, bering, pesho, kashbar, birgo (Pb. Himalayan names; Shama baringi (Nepal).

Habitat:—Sub-tropical Himalaya, from Jammu to Nepal. Garwhal and Bhutan.

A tall, scrambling tree, with stout, often spotted, branches. Bark very bitter; light brown, rather smooth, shining, thin. Wood bright yellow, moderately hard; sapwood white. Annual rings well-marked by a line of pores in the autumn wood. Pores moderately sized, unevenly scattered, except on the line of the annular rings. Medullary rays fine to moderately broad, short, distant, forming on a radial section a pretty silver-grain (Gamble). Leaves pubescent, a foot or more long, of 9-15 leaflets, the lowest pair much smaller and stipuliform; leaflets 6-4 pair, obovate, acuminate, serrate, opposite, nearly sessile. Flower polygamous, in pubescent panicles; small greenish, generally pentamerous. Calyx-segments small, imbricate. Petals ovate or obovate, persistent in female and hermaphrodite flowers. Much enlarged and coriaceous in fruit; filaments strap-shaped, equalling the petals, villous, about the size of a pea, $\frac{1}{4}$ in. diam., black, each containing one erect seed.

Parts used:—The bark, root and leaves.

Use:—Dr. Royle draws attention to the bark, wood and root of this plant as quite as bitter as the quassia of the West Indies, for which it would doubtless prove an excellent substitute. The *Pharmacopœia Indica* regards this bark as worthy of further attention.

The leaves, according to Stewart, are applied to itch.

248a.—*P. javanica*, Bl. H. F. B. I., I. 520.

This large tree is common in the Ataran Forest Division, Tenasserim, where it is called by the Karens "Napaw-ow." The bark is exceedingly bitter and is used by the Karens as a febrifuge instead of quinine. The bark contains a bitter principle allied to quassin, and has an advantage in containing no tannin. There is no alkaloidal principle such as quinine in the bark.

249.—*Brucea Sumatrana* Roxb., H. F. B. I., I. 521. Roxb. 151.

Vern.:—Ampadoo-Barrowing (Mal).

Habitat:—Assam; Eastern Peninsula; Tenasserim; and the Andaman Islands.

A large evergreen shrub, with bitter and somewhat fetid properties. Branchlets, leaves, and inflorescence tawny-pubescent. Leaves very large, often more than a foot long, "covered with a dense yellow pubescence, especially on the veins beneath" (Alfred W. Bennett). The lowest leaflets sometimes compound, the upper ones numerous, very closely toothed or serrate, villous beneath and opposite, 4-6 pair, ovate-lanceolate. Flowers purple, in small distant racemiform panicles, often as long as leaves. Flowers usually hermaphrodite; Calyx very minute. Petals larger than the Calyx-segments, linear, spatulate. Stamens short, not exceeding the petals in length. Ovary deeply 4-lobed. Drupes entirely free, black, ovoid, $\frac{1}{4}$ in. long (Brandis, $\frac{1}{8}$ - $\frac{1}{6}$ in. (Bennett), glabrous, reticulated. Albumen O.

Uses :—Roxburgh wrote : "From the sensible qualities of the green parts of this plant being somewhat fetid, and simply, though intensely, bitter, it promises to be as good an antidy-senterical medicine as *Bruce's Abyssinian Wooginos* itself."

DR. MOUGEOT, whose investigations into the subject of a cure for dysentery have been attracting attention in Saigon for sometime past, now claims to have discovered a remedy for the disease. This is the seed of the plant named *Brucea Sumatrana*, belonging to the family *Simarubaceae*, which is found in those parts of Southern China, Lower India, the island of Sunda and tropical America where the malady prevails in its more virulent form. Both the tree and its seed are known in the vernacular of its *habitat* by the name of *kosu* or *kosam*. It may be remembered that several years ago the scientist, Roger, discovered a bacillus which was held to be the cause of dysentery. In experiments which he conducted upon animals, Dr. Mougeot found that, wherever these bacteria were most numerous in the bowels, the use of the *kosu* seed, which, by the way, is about a centimetre in length and lies hidden within a small oily kernel, led to their utter destruction. He usually administered from six to ten seeds on the first day and twelve on the second, in which time a change for the better generally became apparent. Eight hundred and seventy-one out of eight hundred and seventy-nine cases experimented upon by Dr. Mougeot, proved successful.—*Indian Lancet* for 10th June, 1901.

Messrs F. B. Power and F. H. Lees find that the seeds contain a small quantity of a hydrolytic enzyme, but no alkaloid; they contain 1.8 per cent. of tannin. The combined alcoholic and petroleum extracts of the seeds yielded the following substances : (1) A small quantity of a mixture of esters, probably of one of the butyric acids, and having the odour of the crushed seeds; (2) a very small amount of free formic acid; (3) 20 per cent. (on the weight of the seeds) of a fatty oil consisting chiefly of the glycerides of oleic, linolic, stearic, and palmitic acids, together with a saturated hydrocarbon,

hentriacontane, $C_{31}H_{64}$ m. pt. 67° - $68^{\circ}C.$, and a crystalline substance, $C_{20}H_{34}O$, m. pt. 130° - $133^{\circ}C.$, $[\alpha]_{23}^{D} = -37.7^{\circ}$, allied to the cholesterols, and agreeing in composition with quebrachol, cupreol, and cinchol; (4) Two bitter principles. The bitter principles are found in the aqueous layer of the residue from the steam-distillation of the combined alcoholic and petroleum extracts; the solution also contains a quantity of reducing sugar, and a very small amount of a substance which gives a deep green colour with ferric chloride. One of the bitter principles (a) is completely extracted by chloroform from the aqueous solution and can subsequently be obtained from ether, in which it is sparingly soluble, as a light-coloured amorphous powder. The other bitter principle (b) could only be obtained as a brown extract. The authors could obtain no evidence of the presence of quassin as stated by Heckel and Schlagdenhauffen, nor of the glucosidal bitter principle, named "kosamine" by Bertrand.—J. S. of C. I. September 15, 1903, page 1013.

The bark of *Brucea Sumatrana* yielded an amorphous, bitter principle, volatile acids (formic, acetic, and butyric), proteins, and an acid which was probably behenic acid.—(Ph. J. 1907 Vol. 79 pp. 126-130).

250.—*Balanites Roxburghii*, Planch. H. F. B. I.,
I. 522.

Syn.:—*Ximenia Ægyptica*, B. Ægyptica, Wall.

Sans:—Ingudi-Vrikshaka.

Ver:—Hingan, ingua, hingol, hingota (H.); Egorea, hinger (Guz.); Hingon (B.); Hinganbet, hingan (Dec.); Garah, (Gondi); Nanjunda (Tam.); Mancluta (Mal.); Gari; gara-chethi, ringri (Tel). Hingoriyun (Porebunder and Guz.)

Habitat:—Drier parts of India, from Cawnpore to Sikkim, Behar, Guzerat, Khandeish and the Deccan. Mhasvad Road, Satara district. Burmah.

A scraggy shrub; in favourable situations, a small tree, 30ft. high, with glabrous puberulous branches, ending in very strong, sharp, ascending spines. Wood yellowish white, moderately hard. Bark yellow or cinereous. The roots spread far and throw up root-suckers at a considerable distance from the trunk. Leaves of two elliptic or obovate puberulous, entire coriaceous leaflets. Cymes 4-10-flowered. Flowers white or green, fragrant. Sepals and petals ovate, velvety-pubescent, more than an inch long. Drupes ovoid, $1\frac{1}{2}$ -2in. long, 5-grooved; pulp bitter, with an offensive greasy smell. Stone hard, tubercled.

Parts used :—The seeds, bark, leaves and fruit.

Use :—"The seeds are given in coughs. The bark, unripe fruit, and leaves are pungent, bitter and purgative, and are considered to have anthelmintic properties. The African Arabs use the pulp of the fruit as a detergent and the bark to poison fish." (Dymock.)

According to Surgeon Parker of Poona, the seeds are useful in colic (*Watt's Dictionary*, Vol. I.)

The soft parts of the fruit contain 7 per cent. of the Saponin $C_{18}H_{28}O_{10}$.
J. Ch. S. 1901 A I 648.

A sample of oil prepared by the natives of Marogoro (German East Africa) from the seeds was of a light yellow colour and had a pleasant nutty taste and smell. It had the following characteristics :—Sp. gr. 0.9173 (15°C); Sapon. Value 195.6; Reichert-Meissl Value, 0.55; Polenske Value 0.4; iodine Value, 77.2; Acid Value 8.5; unsaponifiable, 0.07 percent; Stearic acid content, 2.4 per cent. The oil became cloudy at 8.8°C. J. Ch. I. 15th Ma. 1912 p. 442

251.—*Gomphia angustifolia*, Vahl. H. F. B. I., I. 525.

Vern. :—Valermani (Mal); Bokera (Sinhalese).

Habitat :—Southern provinces of the Western Peninsula. Ceylon, common in low country, upper zone, rare in the dry region. Also on the Malabar coast, Singapore and the Phillippines.

A small much-branched tree, young parts glabrous. Leaves 2½-5 in., distichous, nearly sessile, lanceolate, acute at both ends, finely serrate, glabrous, shining, veins very close and numerous, pellucid, with 2 marginal ones near the edge. Stipules deciduous. Flowers numerous, yellow, about ½ in., on slender pedicels, in large pyramidal terminal and axillary panicles. Sepals red, oval, acute, glabrous; petals twice as long as sepals, clawed, obtuse. Stamens 10, filaments very short, anthers large, oblong. Ovary carpels ovoid, smooth. Style stout, very much exceeding Stamens. Ripe carpels 5 (or fewer), attached near their base to sides of the very large gynophore, surrounded by the persistent sepals, ¼-¾ in., ovoid, reniform, purple black, shining. Seed erect, embryo green.

Use :—The root and leaves are bitter, and are employed in the form of a decoction in Malabar, as a tonic, stomachic and anti-emetic (O' Shaughnessy).

252.—*Boswellia serrata*, Roxb. H. F. B. I., 1. 528, Roxb. 365.

Syn. :—*B. thurifera*, Roxb.

Sans :—Salasi-niryâsa, sallaki, kunduru, gugguli.

Vern. :—(The gum resin) Salhe, salci or sâlai, sâlgâ, sêl-gond, kundur, salpe, lubân (H.); Lubân, sâlai, kundro (B.); Salga (Santal.); Anduku, anduga, gûggar, dñmsal (Kumaon); Salla, bor-salci, ganga (Gond), Silai (C. P.); Sâlar (Ulwar); Salai, salga, guggula, salai-dhup, sâlyphali (Bom.); Salaphali (Mar.); Kundur (Duk.); Dhup, mukul salai, gugali (Guz.); Saliya, gugul (Cutch); Kungli, gûgûlu, kûndrikam morada, kundruk-kampishin, parangi-shâmbi-râni (Tam.); Parangi-sâmbrâni, anduga-pisunu, anduku, ându, Adak (Tel.); Vella-kundirukkam (Mal.); Chittu Maddi (Kan.)

Habitat :—Forests of the base of the Western Himalaya as far west as the Sutlej. Central India from Behar to Rajputana, and Southward into the Dekkan and to the Circars and the Conkan within 10-20 miles of the Western Ghats.

A deciduous, middle-sized tree, with a spreading flat crown. Bark nearly $\frac{1}{2}$ in. thick, greenish, ash-coloured, peeling off in thin smooth flakes. Young shoots and leaves pubescent, with simple hairs. Leaves imparipinnate, crowded at the ends of branches; leaflets 8-15 pair, opposite or nearly opposite, sessile, lanceolate, more or less deeply crenate, apex generally obtuse. Flowers bisexual. Calyx small, 5-7-cleft, petals 5-7. Stamens 10-12, inserted at the base of the red annular fleshy disk. Ovary 3-celled, half immersed in the disk; 2 collateral ovules in each cell. Fruit 3-valved, the valves separating from the dissepiments which remain attached to the axis. Seeds 3, enclosed in heart-shaped stones attached to the inner angle. Cotyledons trifid, lobes laciniate, radicle superior.

The leaves fall about March and April, the fresh foliage comes out in June. Flowers, when the tree is leafless, sometimes before the old leaves fall or after the fresh appear. Coppices well, and readily grows from the cutting (Brandis).

"Uses:—The gum of this tree is used as a diaphoretic and astringent, and is used in the preparation of ointment for sores. It is also prescribed with clarified butter in syphilitic diseases; with cocoanut oil for sores; and as a stimulant in pulmonary diseases. The Olibanum is also given in bronchorrœa and chronic laryngitis, employed both internally and in the form of fumigation. An ointment has been prepared from it which is said to be a good stimulant application to carbuncles, ulcerations, boils, &c. The Mahomedans consider it hot and dry, and to have dessicative, astringent properties" (Dymock).

"The resin in tears is known is *kândâr*, but in soft masses it is called *gundah-ferosah*" (Modeen Sheriff.) In Bombay it is known as *gandaberoza*.

Mixed with gum acacia, it is used as a corrective for foul breath. Used for any length of time in one drachm doses it is said to reduce obesity.

Dr. Moodeen Sheriff considers it to be an internal and external stimulant, expectorant, stimulant diuretic and stomachic. It is also a slight hepatic stimulant. Useful in jaundice, not depending on mechanical obstruction, and in some slight and chronic cases of diarrhœa, dysentery, dyspepsia, pulmonary affections and hæmorrhoids. In the form of an oily solution, it exercises some good influence over the growth of the hair; and in that of an ointment, it excites a healthy action in some weak and unhealthy kinds of ulceration.

"The gum-resin is used to promote the absorption of bubo, and is applied locally. The oil in 10 or 20 minim doses is useful in gonorrhœa, taken in demulcent drinks" (Surgeon C. M. Russel, Bengal.)

"Refrigerant, diuretic, and emmenagogue" (Saboona Lal, Hospital-Assistant, Jubbulpore.)

"Astringent, applied in the form of an ointment to chronic ulcers, diseased bones, buboes, &c."

"The *Boswellia serrata* (Salai) gumresin enquiry is now approaching a definite conclusion. During the year samples of the oil and rosin, products of steam distillation, were forwarded for valuation to the Imperial Institute, London. The report on these has been received and is to the effect that the oil closely resembles American Turpentine Oil except as regards smell and is of excellent quality and will readily command a market, the rosin on the other hand is of poor quality, the defects being low saponification value and bad odour. Another experiment is now being carried out under the solvent process. The quality of the gum and resin produced by this process appears to be far superior to that produced by steam distillation and samples are therefore being forwarded to the Imperial Institute for a further report.

As regards the prospects of an industry arising from the tapping of *Boswellia* it cannot be said that these are at present very hopeful, the chief obstacles being the relatively small amount of resin exuded and consequently the high cost of the crude product. Reports from the local forest officers also indicate that tapping may permanently damage the trees so that investigation on this point, viz., whether the trees are damaged by tapping, as well as the best of methods of tapping to obtain the maximum yield is to be undertaken during the coming working season." Annual Report of the Board of Scientific advice for India, 1914-15 pp. 128-129.

253.—*Garuga pinnata*, Roxb. H. F. B. I., I. 528 ;
Roxb. 370.

Vern.:—Kûrak (Bomb.); Kûsimbâ also kâkad (Concan);
Garuga or garugoo (Tel.); Joom (B.)

Habitat:—Throughout India.

A large, deciduous tree. Bark lin. thick, soft red inside, grey or brown outside, exfoliating in large irregularly shaped scales. Wood variable: sapwood white, large; heartwood reddish brown, moderately hard, even-grained. Pores large, not numerous, often subdivided, sometimes filled with resin. Medullary rays short, moderately broad, on a radial section, visible as narrow horizontal plates, and giving a pretty silvergrain (Gamble). Young shoots and inflorescence grey pubescent. Leaves imparipinnate, crowded near the ends of the branches. Leaflets 6-9 pair, opposite or nearly so; lanceolate, or ovate-lanceolate, crenate. Flowers yellow, or pale-yellow, in axillary panicles, several at the end of branches. Calyx campanulate, 10-ribbed, 5-cleft, lined by a thin disk, with a crenate margin, on the edges of which the 5 petals and 10 stamens are

inserted. Ovary 4-5-celled, 2 collateral ovules in each cell. Fruit a fleshy globose drupe, pale yellow when ripe, enclosing 2, rarely more, bony, 1-seeded tuberculated stones. Fresh foliage—April or May—with the flowers or after them. Leafless during the greater part of the dry season.

Parts used :—The fruit, and juice of the leaves and stem.

Uses :—" In Salsette, near Bombay, the juice of the stem is dropped into the eye to cure opacities of the conjunctiva; the fruit is pickled and eaten as a cooling and stomachic remedy. In the Concan, the juice of the leaves, with that of the leaves of *Adhatoda Vasica* and *Vitex trifolia*, mixed with honey, is given in asthma" (Dymock.). The epicarp of the fruit is also cooked in Bombay with the flower heads of the aroid *Shevalâ* plant to reduce the acrid taste of the latter, and eaten as vegetable.

254.—*Balsamodendron mukul*, Hook. H. F. B. I., I. 529.

Sans. :—Konshikaha, guggulu.

Vern. :—Gugal, mukul, ranghan turb (B., H., Dec., Guz.); Maishākshi, gukkal, gukkulu (Tam.); Mahi-saksh gugal (Tel.)

J. Indrajī :—Gugar, gugal. (Porebunder and Guj.) Mukul, Gugal (Marathi); Gugal (Hindi).

Arab. :—Mokl-arzak, aflatân.

Pers. :—Boe-jahudan.

Habitat :—Sindh, Rajputana, Bednore, Khandeish, Berars, Mysore, and Bellary.

A stunted shrub or dwarfed tree. "Bark greenish yellow, peeling in long, thin, shining paper-like scrolls. Wood soft, white. Pores small. Medullary rays fine, short. The bark yields a gum called Gugal" (Gamble).

Branches thick, spreading, branchlets often spinescent. Trunk knotty. The outer bark coming off in rough flakes, leaving exposed an inner layer which is bright, shining and peels off, as noted above from Gamble's remarks, like thin

paper. Leaves generally approximate at the ends of thick short arrested branchlets, obovate, almost sessile, the tapering base entire, the upper part toothed. On luxuriant shoots the leaves are distant, trifoliate, the lateral leaflets small. Flowers unisexual, subsessile, 2 or 3 together. Petal 4-5, strap-shaped. Stamens 8-10, alternately longer. Drupe red, when ripe.

Part used:—The gum.

Use:—"It is used in Native medicine as a demulcent, aperient, carminative, and alterative; especially useful in nervous diseases, scrofulous affections, urinary disorders and skin-diseases, and is used in the preparation of an ointment for bad ulcers." (Watt.)

"Applied as a hot paste to incipient abscesses, as an absorbent. Is used as an expectorant. Aphrodisiac according to Sk. Boali-Saina. Applied locally as a paste in hæmorrhoids." (Dr. Emerson.)

"Held in highest repute in the treatment of rheumatism, given internally and applied locally" (Surgn. Robb.)—Watt, i. 367.

255. *B. Roxburghii*, Arn. H.F.B.I., I. 529.

Syn.:—*Amyris commiphora*, Roxb. 323.

Vern.:—Gugala (B.); Gugal, mahishabola (Bom.); Gugar (Sind.); Kookul (Tam.).

Habitat:—Eastern Bengal, Sylhet and Assam.

Spinescent says Brandis. Branches spiny, (says Alfred W. Bennett in Hooker.) Leaves 3-foliate, terminal leaflet very finely serrulate, lateral leaflets very small.

Use:—The gum resin is also used medicinally like other species of *Balsamodendron*.

Balsamodendron Roxburghii, which, when broken, or bruised, diffuses a grateful fragrance, like that of the finest myrrh, yet that "the juice never congeals, but is carried off by evaporation, leaving little or nothing behind; and all that he (Dr. Royle) could ever procure was a very minute portion of gummy matter, which certainly resembles myrrh both in smell and appearance, but has no tendency to be even tenacious or elastic."

The excellent Dr. Royle, however, rather inclines to the opinion that this tree, when old, does yield a gum resin, closely resembling myrrh, because that which he examined "was said to come from the hills, at the foot of which the tree is found."—Ed.—*Hooker's Journal of Botany*.

256. *B. pubescens*, Stocks. H.F.B.I., 1. 529.

Habitat :—Rocky parts of Sindh, as far south as Karachi. Distributed through Baluchistan.

A small tree, with pubescent, unarmed branches. Leaves 3-5-foliate, on slender petioles, longer than the blade, soft and downy when young. Leaflets entire, lateral leaflets nearly orbicular, terminal, ovate-cuneate, petiolate. Flowers sessile, 4-merous. Stamens equal. Drupe red, with 2 stones; pulp orange-cloured.

Use :—Dr. J. Newton reports that the gum obtained from this tree may be used in the form of ointment for cleansing and stimulating bad ulcers. It is a favorite application in Dehli sores, combined with sulphur, catechu and borax. It is reported to stimulate healthy action, (Pharm. Ind.).

257. *Canarium commune*, Linn. H.F.B.I., 1. 531; Roxb. 504.

Vern. :—Jangli bādām (H.); Jangali bedānā (Cutch); Kaglimara, kagga libija, java bada miyaune (Kan.); Canari (Mal.). Rata-Kakuna (Sinhalese.)

Eng. :—Java Almond tree.

Habitat :—A native of the Malayan Peninsula, but generally cultivated in India.

A large tree introduced into India from Malay. Wood greyish white, soft, smooth (Gamble). Extremities of branches tawny, puberulous or glabrate. Stipules elliptic or rotundate, auricled, often early deciduous. Leaves of flowering branches $\frac{3}{4}$ -1 $\frac{1}{2}$ ft., more or less; leaflets entire, 7-9 ovate to oblong, elliptical, acuminate, glabrous; lateral nerves about 10-15 pair, often paler and sub-prominent beneath. Upper leaflets 4-6 by 1 $\frac{1}{4}$ -2 $\frac{1}{2}$ in.; petiolules $\frac{1}{2}$ -lin. Panicles terminal puberulous, with spreading, successively shorter, lateral branches. Buds

enclosed in ovate-rotundate tomentose bracts. Flowers variable in size, normally 3-merous; female flowers $\frac{1}{2}$ to over $\frac{1}{2}$ in. in length. Calyx campanulate. Stamens in maleflowers, inserted around the hairy rudiment of ovary. Ovary glabrous, incrassate above. Drupe ellipsoidal, subtrigonous with a bony 1-3-celled stone. Cotyledons tripartite, contorted (Blume).

Use :—The gum, according to Ainslie, has the same properties as balsam of copaiba. It is applied in the form of an ointment to indolent ulcers. The oil expressed from the kernels might be substituted for almond oil.

258. *C. strictum*, Roxb. H.F.B.I., I. 534; Roxb. 504.

Eng. :—The black Damar tree.

Vern. :—Kâlâ dammâr (H. B. and Guz.); Dhûp, gûgul (Bom.); Dhûp, râldhup (Mar.); Karapu kongiliam, karapu dammar, congiliummarum, karuppu dâmar (Tam.); Nallarôjan (Tel.); Manda-dhup, raldhupada (Kan.); Thelli (Mala.).

Habitat :—Western Peninsula, Concan, Bababuden Hills, &c.

A very large, straight, deciduous tree. Bark grey, roughish. Wood moderately hard, heart-wood pink, sapwood greyish white. This handsome tree, says Gamble, is one of the most conspicuous trees of the Western Ghat, especially when coming into new leaf, for the young leaves are of a bright crimson colour, very hairy and like red velvet. Branchlets, petiole, midrib and nerves beneath, densely clothed with soft reddish brown tomentum. Leaves imparipinnate, 1-1 $\frac{1}{2}$ ft., long more or less on flowering branches, varying to 4 ft. Leaflets coriaceous, 12, 3-4 pair, serrate or crenulate while young, 3-6 in. long, by 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ (5), in broad secondary nerves, prominent beneath. Petiole $\frac{1}{10}$ - $\frac{1}{8}$ in. Panicles shorter than leaves, upper lateral branches short or male flowers in sessile fascicles. Male flower $\frac{1}{3}$ in. long, in a narrow, racemiform panicle, 6-9 in. long. Calyx tubular, with three shallow broad teeth. Petals coriaceous, oblong, rudimentary, ovary depressed, lobed, hispid. Female flowers in short few-fid racemes, less crowded on stout

longer pedicels, marked with scar of small caducous bracts. Calyx tomentose, campanulate, shortly and broadly 3-lobed. Petals thinly tomentose above. Ovary glabrate, equalling the stout style. Drupe 1-2 in. long, ellipsoid or ovoid, tapering, with a thick, bony stone.

Part used :—Gum.

Uses :—According to Dr. Bidie, the resin is used as a substitute for Burgundy pitch in making plasters. Also employed with gingelly oil in rheumatic pains (Watt ii. 96).

259. *C. bengalense*, Roxb. H.F.B.I., I. 534.
Roxb. 504.

Habitat :—Sylhet and the adjoining districts.

Vern. :—Gogul-dhûp (Nepal) ; Narokpa (Lepcha) ; Tekreng (Garô) ; Bisjang, dhûnâ (Assam).

A tall, ever-green, glabrous tree. Bark $\frac{1}{2}$ in. thick, rather smooth, greyish white, with numerous lenticels, peeling off in small round thick flakes. Wood soft, sapwood yellowish white, heartwood reddish brown. Extremities rusty, pubescent, glabrate, with subulate stipules. Leaves 1-2 ft. Leaflets sub-opposite, 13-21, ovate-oblong or lanceolate, acuminate, glabrous, 3-6 by 1-2 in. Panicles racemiform, from upper axils, shorter than or equalling the leaves ; buds cylindrical. Calyx cupuliform, 3-fid. Petals obvate oblong, 3, imbricate ; filaments confluent, half their length. Disk hirsute, within the stamens. Drupe ellipsoidal, smooth, size of a large olive, 1-3-celled, dark purple, pruinose. Stone trigonous, thick, bony. Cotyledons contortoplicate. A clear, amberlike resin exudes from wound in the bark.

Use :—The leaves and bark are used externally for rheumatic swellings (Watt ii. 94).

N. O. MELIACEÆ.

260. *Turraea villosa*, Benn. H.F.B.I., I. 542.

Vern. :—Kâpur-bhendi (Bom.).

Habitat :—Western Peninsula ; on the Anamally and Mahableshwar hills ; Guzerat at Dolca.

A large or small shrub more or less pubescent with short hairs. Leaves thin, pubescent, ovate, acute or shortly acuminate, acute or obtuse at base, entire; in flower usually about 1½ in., in fruit about 2-4 by 2½-1¼ in. Petioles ¼ in. long, pubescent. Flowers sweet-scented, white, axillary 1-1½ in. long, in few-flowered clusters or short racemes; peduncles short, pedicels ¾ in. long, hairy, tomentose. Calyx short, cup-shaped, pubescent outside, teeth acute. Petals yellow, linear, longer than the Staminal-tube, free, glabrous. Staminal-tube glabrous, slender, ¾-1 in. long, dilated at top, teeth subulate, short. Anthers ½ as long. Ovary 5-celled. Style long, exserted, Stigma capitate, urn-shaped. Capsule sub-globose, glabrate, ½ in. diam. (Talbot). Seeds not winged (W.P. Hiern).

Western Peninsula, on the Ghats, from the Concan southward; Mahableshtar, North Canara. Gujrat at Dolra (Dholara).

Use:—"The root is used as an application to fistulas, and is administered internally in black leprosy" (Dymock).

261. *Naregamia alata*, W. and A. H.F.B.I.,
I. 542.

Vern.:—Kâpur-bhendi, pit-wel, tinpâna (Mar.); Trifolio (Goa); Kanu-dida (Kan.); Nela naregam (Malay.).

Habitat:—Western Peninsula or the Western Ghats, from the Concan southwards.

Parts used:—The roots and stems.

A small, glabrous and shining undershrub. Branches erect or decumbent, from a few inches to 2 ft. long. Leaves trifoliate, 1-4 in. long. Leaflet sessile, cuneate obovate, quite entire, or obtusely lobed, terminal leaflet rather longer than the lateral ones, and about the length of the common petiole. Common petioles winged. Flowers 1-1¼ in. long, quite white, longer than the peduncles. Petals 5. Calyx 5-cleft, small campanulate. Staminal-tube elongated, inflated above, 10 crenate at the mouth. Anthers 10, terminal, shortly oblong, inserted at the crenatures of the mouth, exserted, setaceous-apiculate. Disk annular. Ovary 3-celled, loculicidally 3-valved. Style yellow. Seeds 2 in each cell; albumen fleshy, embryo foliaceous.

Western Peninsula on the Western Ghats from the Concan southward.

Use:—"This is the country ipecacuanha of the Portuguese at Goa. The drug consists of the creeping root, with the slender stems attached to it, the leaves having been stripped off. It has a somewhat pungent, aromatic odour, but hardly any taste; and is given as an emetic, in doses of from 12 to 18 grains. In Southern India it is used as a remedy for rheumatism. In the Concan the Hindus use the leaves and stems in decoction with bitters and aromatics as a remedy for biliousness. In the Southern Concan it is called pit-yel or pitpápra, on account of its well-marked, emetic and bile-expelling properties; it is the best indigenous emetic on this side of India" (Dymock).

It has recently been tried in Madras in acute dysentery and also as an emetic and expectorant, with results similar to those of ipecacuanha, given in equal doses (Pharmacog. Ind.).

An ethereal extract contained 0·3 per cent. of Hooper's alkaloid naregamiane, 2·0 of wax, 2·5 of resin, and 0·9 of fatty oil and coloring matter. The wax melted 58° had a sp. gr. 0·91, acid number 5·9 (Chloroform solution), 6·1 (alcoholic solution), ether number 21·1, and saponification number 27·0. When the alcoholic solution was poured into water, a resin was precipitated, whilst in the solution there still remained a substance which readily reduced Fehling's solution (sugar). The aqueous extract had a faint acid reaction and gave a blue coloration with iodine; a crystalline compound, which is probably asparagine (Hooper), was also isolated and the extract contained proteids, gum, and pectin substances but not tannin. The drug left 5·73–7·1 per cent. of ash, that of the wood being 1·79 and that of the bark 5·97; 5·9 per cent. of dry residue was obtained from the alcoholic and 12·3 from the aqueous extract.

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252. *Melia azadirachta*, Linn. H.F.B.I., I. 544.
Roxb. 368.

Syn.:—*Azadirachta indica*, *Adr. Juss.*

Sans.—The bark:—Nimba-valkalam, Nimba-môlam-valkalam. The fruit:—Nimba-phalam. The oil:—Nimba-tailam, The flower:—Nimba-pushpam. The leaf:—Nimba-patram, The juice:—Nimba-niryâsam.

Vern. :—Of the bark—The Nim or Margosa bark, *Eng.* Nimbki-*chhâl*, *Hind.* Nim-ki-*chhâl*, *Duk.* Vémbu-pattai, véppam-pattai, *Tam.* Vépa-patta, vépa-chettu-patta, *Tel.* Véppa-tôli, ariya-véppa-tôli, *Malyal.* Bevina-marapette, *Kan.* Nim-sâl, *Beng.* Limbacha-patta, *Mah.* Limba-nu-*châl*, *Guz.* Kohumbapotta, nimbugaha-potta, *Cing.* Tama-bin-akhâv, *Burm.* Pôste-azâd-darakhte-hindî, Pôste-nîb, *Pers.* Of the root-bark—The Nim or Margosa root-bark, *Eng.* Nimb-ki-jar-ki-*chhâl*, *Hind.* Nim-ki-jar-ki-*chhâl*, *Duk.* Vémbu-vér-pattai, veppam-verpattai, *Tam.* Vépa-veru-patta, *Tel.* Véppa-mûlam-tôli, *Malyal.* Bévina-béru-patte, *Kan.* Nim-shikar-sâl, *Beng.* Limba-cha-mûli-patta, *Mah.* Limbanujad-*châl*, *Guz.* Kohumba-mûl-potta, nimbu-mûl-potta, *Cing.* Tama-mi-akhâv, *Bur.* Pôste-bêkhe-nîb, pôsteâzâd-darakhte-hindî, *Pers.* Of the fruit—The Nim or Margosa fruit, *Eng.* Nimb or Nimb-kâ-phal, *Hind.* Nim-bachyâ-nînbôliyân *Duk.* Véppam-paramvémbu-pazham, *Tam.* Vépa-pandu, vépa-chettu-pandu, *Tel.* Véppa-kâya, ariya véppa-kâya, *Malyal.* Bévina-mara-hannu, *Kan.* Nim-chapandu, *Mah.* Nim-phal, *Beng.* Limbanu-phal *Guz.* Nimba-gadi, Kohumba-kâ, *Cing.* Tama-asi, *Bur.* Barre-nîb, Barre-âzâd-darakhte-hindî, *Pers.* Of the nut—The Nimor Margosa nut, *Eng.* Nimb-ki-guthliyân, *Hind.* Nim-gutliyan, *Duk.* Vémbu-kottai, véppam-kottai, *Tam.* Vepa-kottai, *Tel.* Véppa-kuru, ariya-véppa-anti, *Malyal.* Bévina-gotti, *Kan.* Nim-gôtli, *Beng.* Limba-cha-anthôli, *Mah.* Limba-nu-gôtli, *Guz.* Kohumba-atta, nimba-kotta, *Cing.* Tamabin-zi, *Bur.* Tukhme-âzâd-darakhte-hindî, tukhme-nîb, *Pers.* Of the oil—Nim or Margosa oil, *Eng.* Nimb-kâ-tél, *Hind.* Nimb-achen-tél, *Duk.* Vémbu-enney, Véppamenney, *Tam.* Vépa-núne, *Tel.* Véppa-enna, ariya-véppu-enna, *Malyal.* Bévana-yanne, bévana-mara-yanne, *Kan.* Nim-tail, *Beng.* Limba-châ-téla, *Mah.* Limbanu-tél, *Guz.* Kohumba-tél, nimba-tel, *Cing.* Tama-sî, tamabin-si, *Bur.* Rôghane-âzâd-darakhte-hindî, Rôghane-nîb, *Pers.* Of the flowers—The Nim or Margosa flowers, *Eng.* Nimb-ké-phûl, nim-ké-phûl, *Hind.* Nim-ké-phûl, *Duk.* Nâmbu-pû, véppam-pû, *Tam.* Vépa-puvvu, *Tel.* Vappapû, ariya-véppa-pû, *Malyal.* Bevina-huvvu, bévina-mara-huvvu, *Kan.* Nim-phûl, *Beng.* Limbâche-phûla, *Mah.* Limba-nu-phûla, *Guz.* Kohumba-mal, nimba-mial, *Cing.* Tama-pôên, *Bur.* Gule-âzâd-darakhte-hindî, gule-nîb, *Pers.* Of

the leaves —The Nim or Margosa leaves, *Eng.* Nimb-ké-pât, nimb-kâ-patta, *Hind.* Nim-ké-patté, *Duk.* Vémbu-ilai, véppam-ilai, *Tam.* Vépa-âku, *Tel.* Veppa ela, ariya-véppa-ela, *Malyol.* Bévina-yale, bévina-mara-yale, *Kan.* Nimpâtâ, *Beng.* Limba-châ-pâne, *Mah.* Limba-un-pândru, *Guz.* Kohumba-kola, nimba-kola, *Cing.* Tamayo-e, *Bur.* Barge-âzâd-darakhte-hindî, barge-nib, *Pers.* Of the gum—The Nim or Margosa gum, *Eng.* Nimb-kâ-gônd, nimb-kâ-gônd, *Hind.* Nim-bâchk-gônd, *Duk.* Vémbu-pishin, veppam-pishin, *Tam.* Vépapi-sunu, *Tel.* Veppa-pasha, ariya-véppa-pasha, *Malyal.* Bévina-gôndu, bévina-mara-gôndu, *Kan.* Trimen—"in Ceylon, in *Sinhalase*, Kohmba, *Tamil,* âVémpu." Nimb-lâsa, *Beng.* Limbâ-che-gônda, *Mah.* Limba-nu-gûndar, *Guz.* Kohumba-melliyam, nimba melliyam, *Cing.* Tama-sî, tama- bin-sî, *Bur.* Samaghe-nib, Samaghe-âzâd-darakhte-hindî, *Pers.* Of the toddy—The Nim or Margosa toddy, *Eng.* Nimb-kâ-nîrâ, Nimba-kâ-nîrâ, *Hind.* Nimba-châ-nîrâ, *Duk.* Véppam-kallu, *Tam.* Vepa-kallu, *Tel.*

Vern. :—J. Indrajî (Porebunder and Guj.) Limbdo. (Marathi) Kadu Nimb; Nimba; (Hindi) Hiva Nim. Vempu (Tamil); Kohomba (Sinhalese).

Habitat :—Common throughout India.

A tall tree, with a straight trunk and long spreading branches. Altogether a very handsome, graceful, shady tree in the Deccan and the Concan, 40-50ft. Bark grey, with numerous scattered tubercles. Wood hard, close-grained; sapwood grey, heart-wood red. Young parts glabrous. Leaves 8-15in., rather crowded near the ends of branches, simply pinnate. Rachis 6-9 inches, says Trimen, glabrous. Leaflets 2-8 pair and alternate, 1-3 by $\frac{1}{2}$ -1 $\frac{1}{2}$ in., 9-15 pair, says Hiern; opposite or alternate, very shortly stocked; lanceolate, falcate, very unequal-sided, oblique at base, coarsely dentate-serrate, glabrous, pale green. Flowers small, in lax, narrow, axillary panicles, 5-8in. long; white, sweet-scented. Sepal rounded, finely ciliate; staminal-tube dilated above, hairy within, teeth truncate, trifid, recurved. Anthers small, erect. Ovary 3-celled. Drupe oblong-ovoid $\frac{5}{8}$ - $\frac{3}{4}$ in., blunt, smooth. Fruit greenish yellow when ripe. Pulp scanty; endocarp bony. Seed solitary.

Planted everywhere in Ceylon; Southern and Western India. Wild in the sub-Himalaya tract, Burma, cultivated in Dun and Shabaranpur Districts, common along Siwalik Hills.

Parts used:—Every part of this plant, except the wood, is used in medicine, namely, the bark, root-bark, young fruit, nuts or seeds, oil, flowers, leaves, gum and toddy.

Physiological Actions.—The physiological actions of all the parts of this plant employed as drugs may be arranged as follows:—

“The root-bark, bark and young fruit—tonic and anti-periodic.

“The oil, nuts, and leaves—local stimulant, insecticide, and antiseptic.

“The flowers—stimulant-tonic and stomachic.

“The gum—demulcent-tonic.

“The toddy—refrigerant, nutrient and alterative tonic.

Therapeutic Uses.—The bark, root-bark, and young fruit are useful in some slight cases of intermittent fever and general debility. The root-bark is more active and speedy in its action than the bark and young fruit. The margosa oil has proved itself a useful local remedy in some chronic forms of skin diseases and ulcers, by stimulating and exciting a healthy action. Applied to foul and sloughing ulcers, it retards the sloughing process to some extent, prevents the production of maggots, and dislodges them if already produced. The oil is also a very useful adjunct to some other and stronger remedies, as chaulmugra oil, as already mentioned in my remarks under the latter drug. The dry nuts of *M. Azadirachta* possess almost the same medical properties as the oil, but they require to be bruised and mixed with water or some other liquid before they can be applied to the skin or ulcers; and their use, is therefore, attended with so much inconvenience that they cannot be resorted to at all, except in those places where the oil is not procurable. A strong decoction of the fresh leaves is a slight antiseptic, and is useful like a weak carbolic lotion in washing

wounds and ulcers, and syringing out the vagina in the after-treatment of parturition, &c. When the pustules of small or cow-pox burst and begin to ulcerate, the Hindu medical practitioners invariably recommend the application of the paste of the fresh margosa leaves two or three times in the twenty-four hours, and speak highly of its healing power. As the paste is a slight stimulant and antiseptic, I thought the supposition of Vythians is not without foundation, and therefore watched some of the cases under its use and found the result to be good in all the slight and ordinary cases. In some severe forms of ulceration from small-pox, however, it proved quite useless, as naturally expected. On the whole, the use of the paste is quite justifiable in many slight and ordinary cases of ulceration from the pustules of small or cow-pox. The aroma of the fresh or recently dried leaves is sufficient to prevent the attack of insects, and they are therefore often placed in books and clothes by the natives of this country ; but they are much inferior to camphor in this respect.

“The flowers are useful in some cases of atonic dyspepsia and general debility. The gum being bestowed with a slight tonic action in addition to its demulcent property, it is a better auxiliary to other remedies than Gum Arabic and feronia gum in catarrhal and other affections, particularly when the latter are accompanied by great debility. The toddy of the margosa tree appears to be of great service in some chronic and long-standing cases of leprosy and other skin diseases, consumption, atonic dyspepsia and general debility, and although I have not prescribed it myself, I am acquainted with several persons who praise the drug very highly from personal use and observation. It is, however, extremely scarce, and this is a great drawback to its use and adoption into general practice.

“*Preparations.*—Of the root-bark, bark and young fruit—Decoction, tincture and powder. Decoction : Take of the inner layer of the root-bark, cut into small pieces, four ounces ; water, two pints ; boil on a slow fire till the liquid is reduced to one pint, and strain while hot. The decoction of the bark is prepared in precisely the same manner, and in both cases the

fresh bark is preferable to the dry and old one. In preparing the decoction of the fruit, they should be selected when they are very young or before attaining half of their natural size; cut into small slices and dry in the sun; and then their proportion to the water and the method of boiling and straining are exactly the same as in the decoction of root-bark. Tincture: Take of the inner layer of the root-bark or bark, in coarse powder, four ounces; alcohol or proof spirit, one pint; macerate for seven days in a closed vessel with occasional agitation, press, filter and add more spirit, if necessary, to make one pint. Powder: The inner layer of the root-bark or bark, or the dry young fruit, may be reduced to powder, passed through a fine sieve and kept in a closed vessel. Of the leaves, nuts and oil—Decoction, paste or poultice and solution. Decoction: Take of the fresh leaves, four ounces; water, two pints; boil till the liquid is reduced to half of its quantity, and strain when cool. Paste or poultice: Bruise and rub the fresh leaves with hot or cold water in a stone mortar, till they are reduced to a soft and pulpy mass. Solution: Bruise and rub the kernel of the nuts with cocoanut oil, water or some other liquid, in a mortar till it becomes well mixed and thin. The oil is either applied by itself or in combination with other drugs, as chaulmugra oil, &c. Of the flowers—Infusion: Take of the flowers, three ounces; hot water, one pint or just sufficient to cover the flowers; infuse in a covered vessel for an hour and strain. Of the gum—Mucilage, which is prepared in the same way as the corresponding preparation of the Indian Gum Arabic, under the head of *Preparation*, in the article *Acacia Arabica*. Of the toddy—There is no preparation of the sap or margosa toddy, it being always used alone.

“ *Doses*—Of the decoction of the root-bark, bark or young fruit, from one-and-a-half to three fluid ounces; of the tincture of the root-bark or stem bark, from one to three fluid drachms; and of the powder of any of the above drugs, from one to two drachms; three or four times in the twenty-four hours. Of the infusion of flowers, from one-and-a-half to three fluid

ounces; of the mucilage of the gum, from one to two fluid ounces; three or four times in the twenty-four hours

Remarks—No less than nine parts of the margosa nim tree are employed in medicine, and I am not aware of any other plant which produces so many drugs.

“The nim or margosa to-day is an important therapeutic agent and requires a special notice. The toddy or sap is yielded either spontaneously or extracted artificially. In the former case, a clear and colorless liquid begins to flow in a very thin stream or continuous drops, from two or three and sometimes more parts of the plant, and continues to do so from three to seven weeks. The trunk and large branches and roots are the parts from which the flow takes place through very small and recent cracks or fissures, and the quantity of the liquid discharged in the 24 hours from the whole tree varies from two to eight bottles according to its size. Of the several margosa trees in Madras and its vicinity known to yield occasionally the sap under discussion, there was one in Mylapore which enjoyed the greatest repute in this respect. This plant was in a small street, at the southern end of the above village, and died about 15 or 16 years ago. It was a pretty large tree, about 50 or 60 years old, and produced the sap every 3rd or 4th year. After the last or fourth occasion, the trunk became rapidly hollow and the plant died soon after this. On each occasion, before the sap began to flow, there was always, for three or four days, a distinct and peculiar rushing or pumping noise of a liquid within the trunk, which did not entirely cease till the discharge actually commenced from three or four parts of the plant.

“The above phenomenon being a sure forerunner of the flow of the sap, as just explained, the owner of the plant (Faiz Ahmed Khan) always gave notice of its occurrence to all his neighbours and many other persons, with a view to be prepared to avail themselves of this extremely rare medicine if they were in need of it. The fame of the sap as a curative agent was certainly so great that the plant was surrounded by people morning and evening, who bought and drank the drug very

eagerly. The price of it was very variable, but generally between 4 and 10 annas per bottle, and at one time it rose to a rupee for the same quantity. The sap was more or less bitterish in taste, with a slight and peculiar aroma of the nim tree and was never known to ferment or possess any intoxicating property. The word *toddy* is, therefore, not correctly applicable to this liquid drug. I have already mentioned the diseases which were most benefited by its use, under the heading of 'Therapeutic Uses.'

"The nim trees which yield the sap artificially seem to be more rare, for I have heard only of three or four of such plants. All these are said to have been pretty young and large trees, and were found near water or on the banks of nullas or water-courses which were constantly wet. The air passing through nim trees is thought to be highly beneficial to health, and hence the practice among the natives of planting nim trees near their dwelling-houses. Many Europeans even believe in this, especially in the North-Western Provinces and Oudh, and frequently cite villages surrounded with nim trees as proverbially free from fever, while adjoining villages have suffered severely. Dr. C. Macnamara advocates the use of the watery extract of dry leaves in leprosy (MOODEEN SHERIFF)."

The seeds are eaten as a substitute for almonds (Trimen.)

The dried leaves powdered are applied locally to the anus of children suffering from intestinal worms (B. D. Basu).

The Therapeutic uses of Neem—By Major D. B. Spencer, I. M. S.—

I have used the leaves, bark, and oil of Neem. All parts of the plant are medicinal.

1. Leaves. A handful of leaves, crushed and flattened, will make an excellent poultice for boils and sores; its action is stimulant and antiseptic.

The dried leaves I have used to preserve books and clothes from vermin.

Internally, two ounces of fresh leaves, made into an infusion, with a pint of boiling water, form an exceedingly useful bitter vegetable tonic and alterative. It has a marked action upon the liver—the stools often become brilliant yellow in colour after its use.

This infusion is also valuable in chronic malarial fever, although not so efficacious as the oil. In chronic syphilitic affections it acts as a powerful alterative. I have used it also in leprosy, but, except perhaps in one case, it had no specific effect upon the disease.

2. The bark has astringent, antiperiodic, and alterative properties, and may be used as an infusion in the same way as the leaves.

3. The oil, I think, is the most active medicinal part of the plant. Externally, it has stimulant, antiseptic, and alterative properties and is very useful in chronic syphilitic sores and indolent ulcers, which show no tendency to heal. If the effect of the pure oil be found too stimulating, it should be diluted with equal parts of some bland oil or even a weaker strength may be necessary.

The oil is also extremely useful as a parasiticide in various cutaneous affections, such as ringworm, scabies, and others, where the presence of any kind of parasite may be suspected. It rapidly destroys the parasite and induces a healthy action. When the parasite is in the deeper layers of the skin, it will be necessary to rub the oil well in for perhaps 10 minutes or more at a time. I have used this oil in mange in dogs and found it useful.

Internally, the oil in 5-10 minim doses, once or twice a day, is useful in chronic malarial fevers, in syphilis, leprosy and other diseases where an alterative action is indicated. I have used it internally for the last 12 years, chiefly in chronic malarial fevers, and have no hesitation in saying that it is a drug of undoubted value in these fevers. *Vide* my "Record of Indian Fevers," 1899, published by Messrs. Thacker, Spink & Co.

In the *Indian Forester* for June 1913, pp. 264-265, Mr. T. P. Ghose, B. Sc., Assistant to Forest Chemist, Dehra Dun, writes:—

NEEM TODDY.

In the December issue of the *Indian Forester*, Mr. Allen brought to the notice of its readers the fact that leprosy persons eagerly take the exudation of *Neem* as a remedy against the hateful malady. This belief is of very old standing, and has in fact originated from the old medical literature of the Hindus. There can be no doubt about the fact that the leaves and bark, and also the oil out of the seeds, have specific medicinal properties. Dr. Watt in his Dictionary of Economic Products has collected opinions of various medical men, both European and Indian, about the medicinal properties of the different parts of this tree. From all these it can easily be gathered that the bark is a good febrifuge, and is especially useful in periodic fever, also in thirst and nausea. The leaves as well as the oil are very useful in skin diseases. They are also a germicide and an antiseptic. Since so many parts of this tree are medicinal, specially when some of them have specific action on the skin, it is but natural that people should ascribe some valuable medicinal properties to its spontaneous exudation. It is not every day that the *Neem* begins spontaneously to exude the toddy, and therefore the rarity of the occurrence adds a good deal to the importance of this product in popular estimation.

A sample of toddy received from Rai Bahadur Har Swarup, Conservator of Forests, Gwalior State, was chemically examined to find out its constituents and to ascertain whether there is any active principle that might produce the effects popularly ascribed to it. The toddy was a milk-like whitish emulsion

with a pale yellow tinge. It was sweet in taste and possessed the peculiar aromatic odour of full ripe *Neem* fruits. On boiling and removing the precipitated albuminous matter, a limpid faintly yellow solution was obtained. Angle of rotation of this solution at 15°C was +11°C. Its specific gravity at the same temperature was 1.0589.

The following is the general composition of the material :—

Moisture	...	...	...	86.56 per cent.
Proteids	...	...	...	0.36 "
Gums and colouring matter	...	...	...	6.17 "
Glucose (grape sugar)	...	...	...	2.90 "
Sucrose (cane sugar)	...	...	...	3.51 "
Ash	...	...	...	0.41 "

Petroleum ether extracted from the dried solids of the toddy only a trace of fatty and resinous matter. Tests for alkaloidal and glucosidal principle were in the negative.

Qualitative analysis of the ash showed the presence of potassium, iron, aluminium, calcium and carbon dioxide in it.

From the above analysis it can easily be seen that the toddy cannot claim any special medicinal properties. It is, like all other toddies, a syrupy solution of sugar plus a little albuminous and gummy matter with the peculiar odour of ripe *Neem* fruits. The valuable active principle of *Neem* which is an alkaloid according to Cornish and a resinous body according to Broughton (*vide* Watt's Dictionary of Economic Products), is absent. Hence the *Neem* toddy can be said to be a cooling nutrient and stimulating tonic, but it does not seem to contain anything which can be said to be useful for leprosy or other skin-diseases.

Dr. Watt also mentions the tapping of *Neem* for its toddy. This is not a general practice, but if it can be successfully tapped, and if it is made available in large quantities, then it might be a fruitful source of country liquor or even alcohol, and in that case the tree might well be brought under the Excise Act.

This investigation was carried out under the instructions of the Forest Chemist.

263. *M. azadarach*, Linn. H.F.B.I., I. 544. Roxb,
369.

The English "Persian" Lilac.

Habitat.—Commonly cultivated in India and Burma; wild in the Sub-Himalaya tract. Supposed to be indigenous in Baluchistan and the Jhelum valley in Kashmir (Brandis) and naturalized.

Syn.—*Melia sempervirens*, Sw.; *M. Bukayun*, Royle.

Sanskrit.—Mahānimba, himadrūma, parvata-nimba-vriksha

(Sans.)

Vern.—Drek, bakain, bakâyan, betain, deikna, bakarja, mahaniḥ (Hind.); Ghorānim, mahā-nim, (Beng.); Gara nim, (Kol.); Thamaga (Assam); Bakainū (Nepal); Bukain (N.-W. P.); Chein, kachen, bakain, dhek, drek, jek, seed = habbulbān (Pb.); Bakyāna, (Pushu); Bakayun, drek (Sind.) Maha limbo, malla nim mubli, (C. P.); Gourī-nim, goulī-nim (Dec); Nimb, mahalimbo, drek, bakayan, wilayati nim (Bomb.); Limbara bakānanimb, wilayati-nimb (Mar.); Dek (Dun); Bakan limbodo (Guz.); Malai, vembu, malai-veppam (Tam.); Taraka vépa, makānim, konda-vepa (Tel.); Bévu, chik bévu, hutchu bevu, kadbevinamara, bettada-bevina (Kan.); Mullay vaempū (Malay.); Ta-ma-ka, ka-ma-ka (Burm.); Maha-nimba, lunumidella (Sing.); Habul-bān (Arab).

J. Indrajī :—(Porbunder and Guj.) Bakān, Bakān-limbdo; (Marāthi) Bakāyin; (Hind.) Bakāyin.

English—The Persian Lilac, Indian lilac, or Bead tree.

A middle-sized, deciduous tree, young shoots and inflorescence sparsely clothed with deciduous stellate hairs, heartwood light red; annual rings marked by a belt of large vessels. Pinnate, 3-4 pair, more or less opposite. Leaflets 3-12, ovate-lanceolate, more or less deeply serrate, sometimes lobed. Flowers lilac, with a strong honey-scent. Staminal-tube purple, $\frac{1}{2}$ in. long, teeth 20-30, linear; anthers glabrous, shorter than, or as long as the teeth. Stigma clavate, 5-toothed. Drupe yellow, when ripe 3-4 in. long.

Uses.—"Hindu writers on *Materia Medica* seem to have almost entirely neglected the *Persian Lilac* in favour of their own *nim*. It has, however, long been used by the Arabs and Persians, who brought a knowledge of its virtues with them into India. They consider the root-bark, fruit, flowers, and leaves to be hot and dry, and to have deobstruent, resolvent, and alexipharmic properties. Thus, the flowers and leaves are applied as a poultice to relieve nervous headaches. The juice of the leaves, administered internally, is said to be anthelmintic, antilithic, diuretic, and emmenagogue, and is thought to relieve cold swellings, and expel the humors which give rise to them" (Dymock).

In America, a decoction of the leaves has been employed in hysteria, and is believed to be astringent and stomachic. The leaves and bark are used internally and externally in leprosy and scrofula; while a poultice of the flowers is believed to have vermicide properties and to be a valuable remedy in eruptive skin diseases. The fruit has poisonous properties, but is used in leprosy and scrofula, and is worn as a necklace to avert contagion. In the Punjab, the seeds are prescribed in rheumatism, and in Kangra they are pounded and mixed with apricots as an external application for the same disease. In Bombay, strings of the seeds are suspended over doors and verandahs during the prevalence of epidemics to avert the disease. The oil is said to possess similar properties to that of the nim; and, according to Ainslie, this species also yields a similar toddy. Emerson states that the gum is used as a remedy for splenic enlargement.

Several parts of the Persian Lilac are considerably employed in America. Thus, "the root bark has obtained a place in the secondary list of the United States Pharmacopœia as an anthelmintic. It has a bitter nauseous taste, and yields its virtues to boiling water. It is administered in the form of decoction (4 ozs. of the fresh bark to two pints of water, boiled to one pint), of which the dose for a child is a tablespoonful every third hour, until it sensibly affects the bowels or stomach, or a dose may be given every morning or evening for several days and then be followed by a cathartic" (*Pharmacop. Ind.*). Moodeen Sheriff states that, after a careful trial of the above preparation, he has arrived at the conclusion that "if the root-bark is vermifuge at all, it is very weakly so."

"Other preparations have been used in America. The dried berries in whisky have been employed against ascarides, tapeworm and verminous diseases, and the pulp of the berries stewed in lard has been used with success against scald head. A fluid extract and syrup prepared from the bark have been recommended, the latter containing vanilla which is said to wholly disguise the bitter and disagreeable taste of the drug (*Year Book of Pharmacy* (1875), 375). A recent writer on the

subject, Mr. Jacobs, states that, when prepared in March or April while the sap is ascending, unpleasant effects have been observed, such as stupor, dilatation of the pupil, &c., which symptoms, however, pass off without perceptible injury to the system. There appears little doubt that, if given in large doses, the bark, leaves, and fruits are all toxic, producing narcotism followed by death. Dr. Burton Brown (Punjab Poisons) records a case in which a European girl ate the berries, became insensible and died. Descourtilz says that six to eight seeds cause nausea, spasm and choleraic symptoms, sometimes followed by death" (WATT).

Margosa Oil.

This oil is obtained from the seeds of *Melia azedarach*.

It has a Sp. Gr. of 0.9023; at 04°/40°; Saponification number, 196.9; iodine number, 52. The oil is solid at the ordinary temperature.

264. *M. dubia*, Cav, H. F. B. I., I. 545.

Syn. :—*M. Superba*, Roxb; *M. Robusta*, Roxb. 369.

Vern. :—Nimbara, limbada (Bomb.)

The fruit, kala khajur, kuáru khajur (Bomb.); Dingkur-long (Assam); Lapshi (Nepal); Kadu khajur (Guz.); Mallay vembu (Tam.); Bevu, letta-beru, kád-bevu, Karibevin, ara-bevu (Kan).

Habitat :—Wild and cultivated in the Eastern and Western Peninsulas.

A very large handsome tree, deciduous, very fast-growing. Bark smooth, dark brown or dark purplish brown, thin. Wood soft, sapwood grey, heartwood reddish white. Young parts stellate-mealy. Leaves crowded, very large, 1-3ft. or more, bi-or somewhat—tripinnate, pinnae 3-6 pair, distant, opposite or nearly so; leaflets 2-5 pair, in each pinna and a terminal one, stalked, oval or ovate, slightly oblique at base, acuminate, coarsely shallowly crenate, the lowest often again pinnate, glabrous; rachis cylindric, glabrous, dilated at base. Corymbose panicles numerous, 4-8in. long. Peduncle axillary, stellate-scurfy. Calyx-segments lanceolate, acute, stellate-mealy. Petals white, linear-oblong, obtuse reflexed, stellate-mealy

outside, pubescent within. Staminal-tube somewhat tapering, hairy within, teeth spreading, filiform; anthers nearly sessile; style long, stigma clavate, 5-toothed. Drupe ovoid, 1-1½ in., smooth and shining, yellowish. Seeds solitary in each cell; pointed, smooth, brown.

Part used :—The fruit.

Uses :—The pulp of the fruit has a bitter nauseous taste. It is a favourite remedy amongst the laboring classes for colic, half a fruit being the dose for an adult. It appears to have hardly any purgative properties, but is said to relieve the pain most effectively. In the Concan, the juice of the green fruit, with a third of its weight of sulphur, and an equal quantity of curds, heated together in a copper pot, is used as an application to scabies, and to sores infested with maggots (Dymock, 173.)

265. *Sandoricum indicum*, Cav., H. F. B. I., I. 553.

Vern. :—Thitto (Burm.); Santor (Malay).

Habitat :—Eastern Peninsula; from Rangoon, Tenasserim to Penang. Introduced into the Western Peninsula.

Trimen :—Sinhalese name—Lunu-midella. Tamil—Malal-Vêmpu.

An evergreen tree, with trifoliate, coriaceous leaves, attaining 60ft. Wood close-grained, moderately hard, medullary rays conspicuous on radial section. Branchlets, inflorescence and leaves velvety. Flowers yellow, in narrow axillary panicles. Staminal-tube 10-dentate, style articulate at base, clavate above, ending in a thickened ring, bearing five obtuse stigmatic lobes. fruit globose, 3in. diam., yellow and velvety when ripe; exocarp a fleshy and edible pulp, endocarp lining the cells, horny, covered with a densely felted mass of long pluricellular hairs, over ½ in. long. Cotyledons filled with starch and oil.

Use :—The root, which is bitter, bruised with vinegar and water, is used by the Amboyans as a carminative and also in cases of diarrhoea and dysentery (Rumphius).

266. *Aglaia Roxburghiana*, H. F. B. I., I. 553.

Syn :—*Milnea Roxburghiana* W. and A., A. odoratissima, Blume.

Vern. :—Priyangu (B, H, Mar. and Sans.)

Habitat :—Western Peninsula, from the Concan and Midnapore southwards.

A large evergreen tree (near the coast in Kanara, a shrub). Bark light brown, smooth, peeling off in flat rectangular scales. Wood bright red, hard, very tough, close-grained, handsomely marked. Annual rings distinguished by a darker belt. Pores small, scanty, in narrow rings of whitish tissue which run concentrically and appear on a cross-section as narrow wavy lines. Medullary rays fine, numerous, evenly distributed; the distance between them equal to or less than the diameter of the pores. Youngest shoots and inflorescences clothed with round peltate scales. Leaves 3-7 in. Leaflets $1\frac{1}{2}$ - $4\frac{1}{2}$ by $\frac{2}{3}$ -3 in., glabrous opposite, pale beneath; naked part of common petiole as long as the upper portion; petiolules $\frac{1}{10}$ to $\frac{1}{4}$ in. Flowers $\frac{1}{2}$ in. diam.; in. diam, says Brandis. Panicles rather supra-axillary, pyramidal; elongate, pedicels short. Calyx dull yellow, often covered with stellate hairs. Petals yellow. Fruit $\frac{3}{4}$ in. diam.; buff-coloured, very minutely pilose. Seed ovoid, surrounded with a white thick, slightly acid edible pulp, embryo green, radicle minutely pilose.

Use :—Said by the Sanscrit writers to be cooling, and useful in burning of the body and painful micturition. The fruit is described as sweet, astringent and tonic. (U. K. Dutt.)

267. *Amoora rohituka*, W. and A. H. F. B. I.,
I. 559.

Syn. :—Andersonia Rohituka, Roxb. 314.

Sans. :—Rohitaka.

Vern. :—Harin hara, barin khana (H.); Tikta-raj, pitraj (B.); Bandri phal (Nepal); Sohaga (Oudh); Sikru (Kol.); Tanga ruk (Lepcha); Lota amari, amora amari (Assam); Shem-maram (Tam. and Mal.); Chaw-a-manu, rohitakah (Tel.)

Habitat :—Assam, Sylhet, Cachar, Oudh, Western Peninsula, from Concan to Travancore.

A middle-sized evergreen tree, with a heavy crown. "Bark thin, grey. Wood reddish, close and even-grained, hard; pores small and moderate-sized. Medullary rays moderately broad, uniform and equidistant, distantly visible on radial section. Pores joined by reddish, soft, wavy, concentric lines. The concentric bands in this species are remarkable" (Gamble). Youngest shoots pubescent. Leaves 1-3ft. Leaflets 9-15, 3-9in. by 1¹/₄-4in., more or less elliptic or ovate, acuminate, opposite, base usually obtuse, shortly petiolulate; secondary nerves prominent beneath. Flowers white, bracteate, subsessile. Trimen says, yellow. Panicles spicate, male branched, female simple, solitary much shorter than the leaves; or branched (W. P. Hiern). Male flowers ¹/₄ in. long. Calyx 5-partite; petals 3, anthers 6, attached to the tube at its base. Staminal-tube 6-toothed. Ovary sessile, short; style short, stigma trigonous, angles opposite the Calyx-lobes. Fruit globose, yellow or reddish when ripe, 1-1¹/₂ in. diam., smooth, 3-celled, 3-valved, pericarp coriaceous. Seed one, oblong, with a scarlet arillus. The seeds supply an economic oil.

Trimen—Sinhalese name, Hingul; found in Ceylon in most regions up to about 3000ft.

Parts used:—The bark and seed.

Use:—The bark of this plant is used as an astringent (Watt). The ripe seeds yield an oil which is used as a stimulating liniment in rheumatism (D. Basu)—Watt's Dictionary.

The seeds spherical, brownish black with a pale brown hilum, and consisted of a thin brittle husk which adhered to the kernel. Weight of 1 seed about 0.7 gm.

Two samples of seed contained 42.5 and 43.5 per cent. of oil respectively.

The oil is viscous, clear, and yellow brown; it has an unpleasant smell and bitter taste. Sp. gr. at 15° C. 0.929—0.931; Saponification value, 193.0—192.3; Iodine value, 131.7—102.5; Hehner value, 92.4; unsaponifiable matter, 1.2 per cent; Reichert-Meißl value 1.2; Solidif pt, of fatty acids (titer test), 32-40 C.

The Oil is suitable for Soap-Making. The residual cake could be used only as Manure on account of its bitter taste.

(Bull. Imp. Inst. 1913).

268. *A. Cucullata Roxb.*, H. F. B. I., I. 560.

Vern.:—Amur; Latmi; Natmi (B.).

Habitat:—Lower Bengal, in the Sunderbunds, and in Nipal.

A glabrous middle-sized, at times a large, evergreen tree, of slow growth, with smooth branches. Bark thin, grey. Wood hard, close-grained, but apt to split; heartwood red. Leaves 6-10in. Leaflets 2-4 pair, falcate, very oblique at base, 3-5in. long; opposite or sub-opposite. Male panicles drooping, about as long as the leaves, with numerous diverging branches, sparingly lepidote. Female racemes few-flowered, supra-axillary. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in., or terminal one longer. Male flower $\frac{1}{2}$ in., yellow. Bracts caducous, 2 at the base of the calyx. Calyx 3-lobed. Petals 3, anthers 6. Staminal-tube turbinate or sub-globose. Seeds covered with a fleshy, bright orange-coloured aril. Capsule globose, $2\frac{1}{2}$ in. diam. Ovary 3-celled; cells 2-ovuled. 3-valved.

Use:—Leaves when bruised applied to reduce inflammation (Prain's Flora of the Sunderbuns, p. 292).

269. *Walsura piscidia*, Roxb., H. F. B. I., I. 564.

Vern.:—Walasura, wallursi (Bomb.); Walsura (Tam.); Chadda-vakku, walsurai, kanná-kampu (Tam.) in Ceylon; Valá-rasi, walurasi (Tel.) (Sinhalese) Kiri-Kon, Mol-petta.; (Tamil) Chedavakku.

Habitat:—Western Peninsula; Malabar and Travancore. Trimen: *Habitat*—Malabar and Travancore, very common in the low country of Ceylon.

A glabrous, generally middle-sized, at times a large, tree. bark $\frac{1}{2}$ in.; greyish brown, tessellated in somewhat erect angular squares. Wood hard; sapwood reddish brown, heart-wood dark red, much streaked with black, close-grained. Leaves trifoliate, 2-7in. Leaflets pinkish, says Trimen, 2-3in. long, elliptic, obtuse, often retuse, glabrous, shining, pale beneath.

Flowers pentamerous, sordid-yellow. Petals imbricated. Staminal-tube half the length of the petals, equally 10-cleft for of its length; divisions all bifid at the apex, hairy above. Petioles $\frac{1}{15}$ -1 in., terminal one longer. Ovary 2-, rarely 3-celled. Fruit egg-shaped, $\frac{3}{8}$ in., covered with a short tomentum.

Varies in appearance and character of foliage. The pulpy aril of the seed is edible and pleasant.

Use:—Corre and Lejanne state that in the Antilles the tree is known as *Herbe à mauvaise gens* or *Herbe à méchants*, and that the bark acts as a dangerous emmenagogue and violent emetic. Mr. Hoelingsworth of Madras has experimented with it, and finds it to be stimulant and expectorant. The fruit of another species of the same genus is said by Forskhal to be the *jauz-el-kai* or the emetic nut of the Arabs, with whom it is also used as hair wash to kill vermin, and as an ointment to cure itch (*Pharmacog. Ind.*).

270. *Heynea trijuga*, Roxb. H. F. B. I.,
I. 565. Roxb. 367.

Vern:—Kapia Kushi, Chenenji (B.); Limbara (Bomb.); Gundira (Mar.); Kora (Kan.); Kora hadi (Mal.)

Habitat:—Forests of N. Oudh; Himalaya, from Nepal to Bhutan; Khasia Mts.; Bengal (Chota Nagpur; Tirhut); Western Peninsula, from the Concan southwards.

Central and Eastern Himalaya, from Kumaon and Oudh to Bhutan. Khasia Hills, Burma, Chota-Nagpur. Hills of Western India. North Kanara and Nilgiri. Godavary district, Manipur.

A small somewhat shrubby tree, sometimes attaining a large size. Bark thin, rough, reddish brown, with lozenge-shaped, depressed lenticels. Wood grey, when young, yellowish white, moderately hard. Leaves imparipinnate. Leaflets opposite, 4 pair, 2-6 in., pale and often softly pubescent beneath. Flowers white, in axillary corymbose panicles. Peduncle nearly as long as leaf. Calyx campanulate, 3-5-cleft, petals valved in

bud. Staminal-tube 8-10-fid. Segments bidentate. Anthers between the subulate teeth of segments. Capsule $\frac{1}{2}$ - $\frac{2}{3}$ in. diam. Valves 2, broad, obtuse. Seed enclosed in a thin white arillus. Testa orange, brown afterwards..

Use:—The bark and leaves possess bitter and tonic principles (Duthic).

271. *Carapa moluccensis*, Lam, H. F. B. I., I. 567.

Syn.:—*C. obovata*, Bl., *Xylocarpus granatum*, Koen.

Vern:—Poshúr, pussur (B.) ; Kandalanga (Tam.)

Habitat:—Muddy sea-coasts, throughout India and Ceylon. In Ceylon 'mangrove swamps, on the west coast ; rather rare. Trimen says. "This is called the common ball tree from the great spherical hard fruit." The Sinhalese name is Mudunelun ; but is generally reckoned with mangroves and called, like them, Kadol.

An ever green tree, all parts glabrous. Bark thin, grey, peeling off in regular flakes. Wood red, hard ; sapwood lighter. Pores small to moderate sized, often subdivided, scanty. Medullary rays prominent, fine, numerous, uniform and equidistant. Annual rings distinctly marked by a continuous belt of pores, and a dark line (Gamble). Stem 25-40ft. high, clear stem 8-20ft. long, girth 4-6ft. Leaves abruptly pinnate, or occasionally simple, the smooth rachis brown or red ; leaflets in 2 or a single pair, rarely the one or other solitary ovate to obovate oblong, narrowed at base, very shortly petioluled, round or retuse at the apex, 3-4in. long, entire, fleshy, coriaceous when fresh, glossy on both sides. Flowers pinkish yellow (Trimen), rather small, nearly 4 in. in diam., on 3-4 in. long, thick pedicels, forming meagre, short, glabrous panicles or racemes in axils of the leaves. Calyx 4-cleft, the lobes rotundate. Petals 4, about 2 in. long. Staminal-tube 8-lobed. Capsule globose, as large as a small shaddock, or smaller, apiculate, containing 5-6 very large angular brown seeds. (Kurz Fl.

Burma, Vol. I. p. 226.) The *C. Molluccensis*, Lamk. has a smaller fruit than the one given in the plate in this work (K. R. K.).

Use:—The bark, in common with other parts of the tree, possesses extreme bitterness, conjoined with astringency; it may probably prove a good astringent tonic. It is much employed by the Malays in cholera, colic, diarrhœa, and other abdominal affections.—Ph. Ind.

272. *Soymida febrifuga*, *Adr. Juss.*, H. F. B. I., I., 567.

Syn.:—*Swietenia febrifuga*, Roxb. Fl. Ind. II 398.

Sans.:—Patranga. Rôhini.

Vern.:—Rohun rohunna rakat rohan (Hind.); Rohan rohina rohra (Beng.); Rakat rohen (Kol.); Ruhen (Santal.); Sohan, suam, mal (S. P.); Rohni bugut rori rohun (C. P.); Soimi (Goond.); Royta (Bhil.); Rohan, merwara, rohun, rohunna, roven, ruhin (Deccan); Rohan rohing (Bomb.); Rorna (Kathiawar); rohina (Guz.); Shem, wond wundmarum shem-maruin (Tam.); Sumi somida moun cheva moun (Tel.); Suámi simemara some (Kan.). J. Indrajī:—(Porbunder) Rona; (Guj.) Rohani; (Maráthi) Rôhin, Potar; (Hindi) Rohan.

Habitat:—Hilly districts of North-Western, Central and Southern India, extending southwards to Travancore.

A lofty, deciduous, glabrous tree. 'Bark $\frac{1}{8}$ to $\frac{1}{2}$ in. thick, bluish grey or dark brown. Sapwood small, whitish; heartwood extremely hard and close-grained, very dark, red-brown, very durable, with numerous fine concentric lines of lighter colour, often closely packed. Pores moderate sized, scanty. Medullary rays moderately broad, distinctly visible on a radial section as dark shining plates, making with the section of the black pores, a very pretty silver grain having a satiny lustre" (Gamble). Trunk tall, straight, symmetrical. Bark bitter. Leaves paripinnate, petioled, with a thickened base, leaflets opposite, rarely serrate, 3-6 pair, 2-4 in. long. Secondary nerves

10-14 pair, alternating with shorter, intermediate ones; tertiary nerves prominently reticulate. Flowers bisexual. Pentamerous, greenish white, in large terminal panicles, with triangular bracts. Petals obovate, narrowed into a claw, contorted in bud. Staminal-tube cup-shaped, 10-cleft, each segment with 2 short, fleshy teeth, the anthers between them on a short filament. Capsule smooth, 1-2 in. long, 5-celled, valves separating from the dissepiments, which remain attached to the thick spongy axis. Seeds numerous in each cell, flat, imbricated, winged at both ends.

Reproduces itself by root suckers.

Uses :—The bark is officinal in the Indian Pharmacopœia where it is described as astringent, tonic and antiperiodic.

In intermittent fevers and general debility, in the advanced stages of dysentery, in diarrhœa, and in other cases requiring the use of astringents, it has been used with success.

Of the powdered bark, a drachm twice daily. This is the best form of administration.

The decoction forms a good substitute for oak-bark, and is well adapted for gargles, vaginal injections and enemata.—(Ph. Ind.)

273. *Chickrassia tabularis*, *Adr. Juss.*, H.F.B.I., I. 568.

Syn. :—*Swietenia Chickrassia*, *Roxb.* 370.

Eng. :—The Chittagong wood.

Vern. :—Chikrassi, pabba, dalmara (B.); Boga poma (Ass.); Pabha pubha (Bom.); Pabba, palara, nûl (Mar.); Aglay, agal, agle-marum, elcutharay (Tam.); Madagari vembu Chittagong chettu, Chittagong karu, cheta kum karra (Tel.); Dovedale (Mal.); Dalmara, lal devdari (Kan.); Maiu (Hyderabad). Hulanhik (Sinhalese); Aglad Kaloti (Tamil.)

Habitat :—Low country, Ceylon; Western Peninsula, from the Concan to the Coorg; also in Bombay, Malacca, Assam, Eastern Bengal, Chittagong, Forests of Burma, from Shan Hills.

A very large tree. Bark reddish brown, deeply vertically

cracked. Wood varying from yellowish brown to reddish brown, with a beautiful satiny lustre, seasons and works well. Sapwood of lighter colour (Gamble.) Trunk straight, tall, young pairs pubescent. Leaves pinnate, rachis 8-10 in., cylindrical, softly tomentose. Leaflets 10-16, usually 12, stalked, alternate, $2\frac{1}{2}$ -5 in., ovate, very unequal at base, acuminate, acute, entire, closely velvety, tomentose on both sides, dark green above, paler beneath. Flowers pale green (Trimen), $\frac{1}{8}$ -lin., pedicellate, in large terminal pyramidal panicles. Calyx-lobes shallow, rounded, hairy. Petals linear-oblong, spreading. Staminal-tube $\frac{1}{2}$ in. Style as long as staminal-tube. Capsule $1\frac{1}{4}$ in., broadly ovoid, apiculate, smooth, brown, valves woody, separating entirely from the 4-winged axis. Seeds closely packed, compressed with a broad, obtuse, terminal wing, twice as long as themselves.

Use :—The bark is powerfully astringent (O'Shaughnessy.)

274. *Cedrela toona*, Roxb. H. F. B. I., I. 568.
ROXB. 663.

Eng. :—The Toon or Indian mahogany tree.

Sans. :—Tunna, kuberaka, nandi-vriksha.

Vern. :—Tun, tuni, lún, mahánim, mahálimbo, túnká-jhár, túna, lúd (H.); Tuní, tun, lúd, tunna (B.); Kujya (Tippera); Somso (Bhutia); Katangi (Kol.); Mahalimbu (Uriya); Drawi, chittisirin, tún, drab, deri, bisrúi, darab, khúshing, khanam (Pb.); Túni, babich, labshi (Nepal); Simal (Lepcha); Poma, henduri poma, tún, jia, tunga (Ass.); Deodari, kúruk (Mar.); Deodari, kuruk, túndu, tún (Bom.); Túnu-maram, tún-maram, mali, wunjúli (Tam.); Nandi-chettu, nandi (Tel.); Arana-maram (Mal.); Suli, máli (Salem); Kal kilingi (Nilghiris); Tundie, Kempú-gandagheri, tunda, Sanola-mara, devadari (Kan.)

Habitat :—Tropical Himalaya, from the Indus eastward, and throughout the hilly districts of Central and Southern India.

A large deciduous tree, with a dense spreading crown. Bark thin, grey, dark brown, exfoliating when old, in irregular woody scales. Wood brick red, soft, shining, even-grained, fragrant; seasons readily; does not split or warp (Gamble). Leaves paripinnate, 1-2ft. long, generally glabrous. Leaflets 8-30, usually opposite, 2-6 by $\frac{3}{4}$ -2 $\frac{1}{2}$ in., lanceolate or ovate-lanceolate, acuminate, sometimes pubescent beneath; margins entire, usually wavy; base acute, somewhat oblique. Petiolule $\frac{1}{3}$ - $\frac{3}{4}$ in. long, slender. Flowers cream-coloured, scented like honey, in ample drooping panicles. Calyx short, lobes ciliate. Petals $\frac{1}{6}$ - $\frac{1}{3}$ in. long, free, oblong or ovate, ciliate. Disk hairy at the orange-coloured lobes. Stamens 5, inserted on the lobes of the disk. Stigma capitate, with a large depression at apex. Capsule septifragally dehiscent, $\frac{3}{4}$ lin long by $\frac{1}{5}$ - $\frac{1}{3}$ in. diam., oblong or oblanceolate, dark brown. Seeds reddish brown, light, with a submembranous wing at either end, about $\frac{1}{2}$ in. long, including the wings.

Dun and Sharanpur, generally in marshy places. Tropical Himalaya, from the Indus eastward throughout the hilly districts of Central and Southern India. Burma. Absent in Ceylon.

It is known as the red Toon.

Parts used :—The bark and flowers.

Uses :—The bark of this tree is a powerful astringent, and may be resorted to when other remedies of the same class are not available. Dr. Waitz (*Dis. of Children in Hot Climates*, p. 225) used with success an extract of the bark in chronic infantile dysentery. Blume attributes valuable antiperiodic virtues to it, and in this character it is favourably noticed by Dr. J. Kennedy (*Ann. of Med.* 1796, Vol. I, p. 387). Dr. Æ. Ross speaks of it as a reliable antiperiodic, and, Dr. J. Newton, as a good substitute for cinchona. The dose of the dried bark is about an ounce daily in the form of infusion. The powder of the bark was found by Dr. Kennedy to be of great service as a local astringent application in various forms of ulceration. (Ph. Ind.)

The flowers, called gul-tur in Bombay, are considered emmenagogue.

These flowers which constitute an Indian dye stuff of minor importance, yield a minute amount of a red, crystalline colouring matter $C_{15}H_{13}O_3$, identical with the nycanthin obtained by Hill from the flowers of *Nycanthus arbor tristis*. This melts at 285° — 287° and not 234° — $235^{\circ}C$, as given by Hill, and in dyeing and other properties closely resembles, but is not identical with, the bixin of annatto (*Bixa Orellana*). The presence of quercetin contaminated with a trace of an allied colouring matter as glucosides, and of a sugar, $C_{12}H_{22}O_{11}$ have also been detected, and to the former the main dyeing properties of the flowers appear to be due.

J. Ch. I. 31st August, 1912 p. 765.

275. *Chloroxylon swietenia*, D.C. H. F. B. I.,
I. 569.

Syn. :—*Swietenia Chloroxylon*, Roxb. 370.

Eng. :—The Indian Satinwood.

Vern. :—Dhaura, bhirra, girya (H.); Behru, biluga, bhayrú bheyri (Uriya); Behra, girya, behru, bihri (C. P.); Sengel sali (Kol.); Bhira (Gond.); Hulda, billú hardi, bheria (Bom.); Halda, bheria (Mar.); Múdúdad, burús, purúshmúdúdad-maram, purus-burus, vummray, múdúda, vummaai-porasham, kodawah-porash, kodawah-porasham, vummay-maram, Kodawa, purrh (Tam.); Billu, billuda, bilgu, biluga, billuchettu, billakora, billukura, bhallú-chettu (Tel.); Mashuda (Kan.); Huralu (Mysore). Ceylon Tamil, Muttrai; Buruta (Sinhalese).

Habitat :—Western Peninsula, from the Concan to the Nilghiris. Ceylon dry regions.

A moderate-sized, deciduous tree. Bark $\frac{3}{8}$ in. thick, soft, spongy, light grey or yellow. Wood very hard, yellow, or cream-coloured, the inner wood darker than the outer, but no distinct heart-wood; having only a fine satiny lustre; fragrant. Young parts, petioles and inflorescence covered with grey pubescence. Leaves paripinnate 5-9 in. Leaflets 10-20 pair, $\frac{3}{8}$ — $1\frac{1}{2}$ by $\frac{1}{4}$ — $\frac{5}{8}$ in., opposite, sub-opposite or alternate, gland-dotted un-equal-sided, obtuse. Flowers bisexual, cream-coloured, in small, terminal and axillary panicles. Pedicels longer than the flowers. Petals 5, coloured, spreading, imbricate in bud. Disk fleshy, 10-lobed. Stamens 10, inserted outside the disk at its base; anthers cordate, apiculate, versatile. Ovary immersed in the disk, 3-celled; ovules 8 in each cell. Capsule 1 in. long by $\frac{1}{2}$ in. thick, oblong, coriaceous, 3-celled loculicidally, 3-valved, the

dissepiments remaining attached to the valves. Seeds imbricate, oblong winged, compressed; cotyledons plano-convex. Exalbuminous.

Found common in the dry regions of Ceylon. There is a good tree in the Ratnagiri Club garden. It yields the well-known satin wood, very hard, heavy, fine-grained, yellow, (reddish-brown rather, K. R. K.), with a satiny lustre. It is the principal timber from Ceylon (Trimen).

Parts used:—The bark and leaves.

Use:—The astringent bark is sometimes prescribed (Dymock). Leaves are applied to wounds (Beddome): also used in rheumatism (C. P. Gaz. 118). Watt ii. 270.

N. O. OLACINÆÆ.

276. *Olaæ scandens*, Roxb. H. F. B. I., I 575; ROXB. 55.

Vern.:—Dheniani (H.); Koko-arn (B.); Rimmel (Kol); Bodo-bodo-ria (Yriya); Hund (Santal); *Harduli*; *Urchirri* (Mar); Kurpodur; marki; malle, turka-vepa; bapanamushti; kotiki (Yel). Kakundan (Jabalpur); Kadalracnhi (Tam.).

Habitat:—Tropical Western Himalaya in Kumaon; Oudh Berar; Central and Southern India. Rohilkund, Tenasserim, Burma, Ceylon (dry country rather common.)

A large, rambling shrub, sometimes a climber. Bark grey, $\frac{1}{4}$ in. thick, deeply cleft vertically, vessels large. Wood porous, yellow-white, soft (Gamble.) Trunk as thick as a man's thigh. A few stout thorns on the older branches. Branches terete, more or less puberulous, prickly, stout, curved. Branchlets, petiole and midrib puberulous. Leaves distichous, ovate, oblong or oblong-lanceolate, 2-3 in. long, yellowish-green, glabrous or sometimes puberulous beneath. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. Racemes solitary, axillary half the length of the leaves. Peduncles erect, twice the length of the minute bracts. Flowers many, white, sweet-scented, small, $\frac{1}{8}$ in. Bracts ovoid caducous. Buds ovoid. Calyx puberulous or glabrescent. Petals 3-5-6, irregularly cleft. More or less cohering, says Brandis; linear, acute, recurved. Fertile stamens 3, anthers oblong. Staminodes 2-fid.

Ovary ovoid-oblong, 1-celled, 1-rarely 2-ovuled. Drupe ovoid, a globose, yellow, $\frac{3}{4}$ covered by the accrescent membranous calyx, apiculate.

Use:—In Chutia Nagpur, a preparation of the bark is given for proverty of blood during fevers (Campbell).

277. *O. Nana*, Wall. H. F. B. I., I. 576.

Vern.:—Merone met (Santal) (Porebunder and Guj.) Sudi; Himi. Tadholi, called Shigroti at Junagadh (J. Indraj).

Habitat:—Hot valleys of the Western Himalaya, from Nipal westward and in the Punjab, Porebunder.

An undershrub, with a woody root-stock, from which annual shoots, about 2ft. high, spring up during the rains. Stems ribbed. Leaves alternate, $1\frac{1}{2}$ - $2\frac{1}{2}$ by $\frac{1}{2}$ - $\frac{3}{4}$ in., oblong lanceolate, subsessile, glabrous and light green above, glaucous beneath; margins recurved; midrib prominent beneath, straight; lateral nerves indistinct. Flowers solitary, $\frac{2}{3}$ in. across; buds ovoid. Calyx minute, accrescent. Petals 3, oblong-lanceolate; fertile stamens 3, opposite to the petals. Staminodes 5-6, bifid, longer than the fertile Stamens. Ovary 1-celled. Style simple, terminal. Fruit the size of a pea, globular, (Kanjilal).

On the crest of the Saharanpur, Sewalik, behind Rampur. Hot valleys of the Western Himalaya. From Nepal westward and in the Punjab. Bengal, in the grass lands of the sub-Himalayan tract.

Use:—The fruit is used medicinally by the Santals (Campbell).

278. *Sarcostigma Kleinii*, W. and A. H. F. B. I., I. 594.

Vern.:—Puvana, puvenagah (=the plank) adul, odul (=the oil).

Habitat:—Eastern and Western Peninsulas; Cochin, Malacca, Maingay, and Travancore, the Concan, in evergreen parts.

A climbing, branched shrub. Wood without zones. Branches terete. Leaves alternate simple, coriaceous, 4-10 by 2-4 in., glabrous, oblong or oblong-lanceolate, acuminate, pale on both

surfaces; base rounded; nerves prominent beneath. Petiole $\frac{3}{4}$ in., transversely wrinkled. Rachis extra-axillary angular, covered with brownish strigose hairs. Flowers $\frac{1}{2}$ in. diam. Male flowers:—Calyx minute, pilosulous, cup-shaped, obscurely 4-5-lobed. Petals $\frac{1}{2}$ in., glabrous, oblong, acute. Stamens as long as the petals, filaments glabrous, flat, strap-shaped; anthers 2-celled. Rudiment of pistil conical. Female flowers:—Calyx and Corolla as in the male. Ovary obovoid, pilosulous, surrounded by 5 hypogynous abortive stamens. Stigma subsessile, conical. Ovules 2, collateral. Fruit 1-1 $\frac{1}{2}$ in. olive-shaped, somewhat compressed, bright orange-red, rugose and strigose externally, smooth within.

Use:—The oil is highly esteemed in the treatment of rheumatism (Drury).

N. O. CELASTRINEÆ.

279. *Euonymus tingens*, Wall. H. F. B. I., 610.

Vern.:—Kungku (N-W. P.); Newar, kashri (Nepali);

Chopra; mer mahan (Simla). Skiosh (Bassahir); Bhambeli, Roini (Jauns.)

Habitat:—Western temperate Himalaya, alt. 6-1,000ft. From Sutlej to Nepal; Simla.

A tree 16-20ft. Branches cylindric. Leaves 1 $\frac{1}{2}$ -3in. by $\frac{3}{4}$ -1in., thick, coriaceous, lucid, rugose and dark green above, very pale beneath, ovate-lanceolate, sharply serrate. Peduncles compressed. Flowers usually pentamerous. Cymes fascicled; petals abruptly clawed, nearly orbicular, coarsely crenulate, $\frac{1}{2}$ in., yellowish, with purple veins. Fruit $\frac{1}{2}$ in. across, nearly round, 4-5-angled. The flowers of this species are sometimes tetramerous (Lawson).

Uses:—It is considered by the Natives to be useful in disseses of the eye (O'Shaughnessy).

280. *Kokoona zeylanica*, Thwaites, H. F. B. I., I. 616.

Habitat :—Western Peninsula, Annamally Hills (S. India), Ceylon between 1,000-4,000 ft., rather rare.

Vern :—Trimen : Sinhalese, Kokun, Wana-potu.

A very large tree, much-branched. Bark rough, corky, grey, bright yellow within. Wood pale, yellowish brown, smooth, light, readily splitting. Young parts glabrous. Leaves $2\frac{1}{2}$ -4 in., obovate, cuneate at base, rounded or retuse at apex, entire or faintly serrate, coriaceous, glabrous, paler beneath and there punctate with numerous, minute, glandular dots, each covered with a red scale. Petiole about $\frac{1}{2}$ in. Stipules very minute, triangular, persistent. Flowers dull, yellowish-brown, $\frac{1}{2}$ in., in axillary or extra-axillary panicles, much shorter than the leaves. Pedicels glabrous. Bracts minute. Calyx glabrous, lobes very shallow. Petals broadly ovate, or rounded, concave, thick-dotted, within stamens shorter than the petals. Disk fleshy, dark green. Capsule nearly 4 inches, oblong-ovoid, bluntly trigonous, valves thick, coriaceous, glabrous. Seed compressed, over 5 in. long (with the wing); wing broadly oblong, straight on one side, oblong, veined, orange-yellow.

Use :—The inner yellow bark is employed medicinally. It is also made into a kind of snuff, which excites copious secretion, and is considered beneficial in headache (Watt).

281. *Celastrus paniculatus*, Willd. H. F. B. I., i. 617. Roxb. 209.

Syn. :—*C. multiflora*, and *C. nutans*, Roxb.

Habitat :—Tropical and sub-tropical Himalaya, Punjab and throughout the hilly districts of India; Burma, Ceylon.

Sans :—Jyotishmati. Kanguni.

Jyotishmati is also one of the Sanskrit names of *Cardiospermum helicacabum*.

Vern. :—Māl-Kaṅṅi (H. and Bomb.); Mal-Kakni (Oudh, Kumaun); Kahundan rangul (C. P.) Kangoni, pigavi (Mar.); Ruglim (Lepcha); Valuluvai, atiparich-cham (Jam.); Mal-kanguni-vittulu Tel.; Sankhū (Pb.); Kariganue (Kan.) Mal-kanguni-ka-jantar (Dec.)

J. Indrajī :—(Porebunder and Guj.) Mālakāṅkaṇā;

Malakakani, Malkân kanino Velo ; (Marathi) Pengi, Mâlkângoni, Kangoni; (Hindi) Malkangni, Mâlkangi.

(Sinhalese) Dubudu.

A large, climbing shrub. Bark usually yellow, corky, sometimes fibrous, spirally twisted and smooth. Wood porous, soft, very variable, according to locality and climate.

Young shoots marked with lenticels (Kanjilal). Leaves alternate, very variable in size and shape ; generally 2-4 by $1\frac{1}{2}$ -3 in., obovate, orbicular, elliptic or oblong lanceolate, short-acuminate, more or less coriaceous, glabrous ; base acute, lateral nerves 4-6 pair, parallel to margins. Petiole $\frac{1}{4}$ - $\frac{3}{8}$ in. long. Flowers $\frac{1}{2}$ in., pale or yellowish green in terminal pedulous pyramidal panicles, 2-4 in. long. Pedicels slender, puberulous. Calyx-lobes shallow, unequal, rounded toothed. Petals oblong, broad-based, acute. Disk inconspicuous. Anthers large, about the size of the petals. Ovary free, stigma simple. Capsule $\frac{1}{2}$ in. broadly ovoid or roundish, blunt, transparently wrinkled, bright yellow ; valves septifragal above, leaving the seeds exposed. Seed $\frac{1}{2}$ in., cinnamon-brown, striate, completely enveloped in scarlet fleshy aril.

Tropical and sub-tropical Himalaya. Throughout India, Burma, Ceylon.

Parts used —The seeds, leaves and oil.

Use :—The seeds are thought by the natives to be hot and dry, aphrodisiac and stimulant, useful both as an external and internal remedy in rheumatism, gout, paralysis, leprosy, and other disorders which are supposed to be caused by cold humours. The crushed seeds, combined with aromatics, are said to be very efficient in removing local pains of a rheumatic or malarious nature.

In the Concan, 4 tolas of the leaf-juice are given as an antidote in overdoses of opium, and the seeds, made into a paste, with cow's urine, are applied to cure scabies (Dymock).

In Ajmere, the seeds are considered sudorific (Irvine).

By a rude form of distillation, the Natives obtain from them a black empyreumatic oil, which, under the name of "*Oleum nigrum*," was brought forward by the late Dr. Herklots

as a sovereign remedy in *Beri-beri*. In doses of from ten to fifteen drops, twice daily, it is a powerful stimulant. Its action in this character is generally followed in a few hours by free diaphoresis, unattended by subsequent exhaustion. Though it has failed to realize Dr. Herklots' encomiums, yet, in some cases treated with it, detailed by Dr. Malcolmson, its beneficial effects were unequivocally evidenced; in others, however, it failed. It appears to be chiefly adapted for recent cases, and for those in which the nervous and paralytic symptoms predominate (Pharm. Ind.)

The Santals use the oil in disorders of the stomach (Revd. A. Campbell). The seeds, bruised and formed into a poultice, are a good stimulant application to foul, unhealthy and indolent ulcers (Moodeen Sheriff.)

I have been using the *black oil* myself occasionally in my practice during the last thirty-nine or forty years; and for about fifteen years, at the commencement of this period, my opinion as to its therapeutic value was not very high; but ever since I began, about twenty-five years ago, to employ the varieties of this drug obtained from Vizagapatam, Masulipatam and Ellore, I consider it the best and most efficacious of all the remedies ever suggested for the treatment of *Beri-beri*, and quite agree with Dr. Herklots in everything he has said in its favour. I recollect many cases of *Beri-beri* which were not benefited, for weeks or months, under the use of other medicines, but began at once to improve when placed under the course of *black oil*. The first good effect of this medicine, according to my own observation, is generally an increase in the quantity of urine, and with this the dropsical effusion begins to disappear. A relief in paralytic and ansthetic symptoms is also noticed about the same time, but generally after the abatement of dropsical symptoms. During the use of *black oil*, the native practitioners invariably enjoin a very low and strict diet, giving nothing to the patient except water and wheaten cakes for a long period—a restriction which is as injurious as unnecessary in my opinion. The patients laboring under *Beri-beri* require a very liberal and nourishing diet.

I have also used this oil in some simple and uncomplicated cases of dropsy, and with good and encouraging results.

The seeds are supposed to have the property of stimulating the intellect and sharpening the memory. The oil is used in the courts and colleges by a great many *pandits* and *munshis* to increase the intelligence of their pupils.

282. *Gymnosporia montana*, Roxb. H. F. B. I., I. 621., ROXB. 208.

Sanskrit :—Vaikankat, Vikankat.

Vern. :—(Baluch)—Vingar; (Hindi) Baikal; (Ajmer) Kakra; (Marathi) Bharuli; (Kanara) Tandraja; Sherawane. (Trans-Indus); Talkar, kharai (Pb.); Baikal, gaja-chinni (C. P.); Mal Kangoni, Zekadi (Bomb.); Danta, babur (Gordi); Danti, pedda chintu (Tel.)

J. Indrajī :—(Porebunder) Vikaro; (Guj.) Vikalo; (Marāthi) Vekar, Vekal; (Hindi) Kingani.

Habitat :—Throughout the drier parts of Central, South-Western and North-Western India, common in the Punjab, Sindh, Rajputana, Central Provinces, Bihar, and the drier districts of the Peninsula. Flower at various times of the year. Afghanistan Malay Archipelago.

A tall armed shrub, spines often bearing leaves and flowers; under favourable circumstances a small tree. Leaves grey, coriaceous, exceedingly variable in shape and size, obovate, oblanceolate to linear-spathulate, narrowed into the petiole. Flowers small, pale, greenish white. Cymes axillary or fasciculate, on short branchlets, often forming terminal, elongate panicles. Capsule $\frac{1}{2}$ in., usually 2-valved. Seeds 1, 2, rarely 3.

Use :—The bark ground to a paste, applied with other oils to the head, for destroying pediculi.

283. *Elæodendron glaucum*, Pers. H. F. B. I., I. 623, ROXB. 214.

Syn. :—E. Roxburghii, W. and A.

Vern. :—Mirandu, padriún, bakra (Pb.); Bakra, chauli, shanria (N.-W. P.); Chauri (Oudh); Karkava, irkuli, chelupai-maram (Tam.); Nerija, booligi (Tel.); Miri, thanki (Kol.); Newri (Santal). The leaves—Bhutâpâla (Mar.); Tamrug; Aran tandig bhukas (Bomb.), Burkas (Konan).

Habitat :—Throughout the hotter parts of India.

A moderate-sized or large tree, often with reddish branchlets. Bark dark-grey, smooth, blood-red inside, exuding when cut a profuse watery sap from the cambium layer. Leaves opposite or sub-opposite; less frequently alternate 2-6 by 1-3 in., elliptic ovate-oblong or obovate, acuminate, crenate subcoriaceous, glabrous, dark green and shining above, glaucous beneath. (Whence the specific name "Glaucum") main lateral nerves about 10 pair, slender; petiole $\frac{2}{5}$ -1 in. long, channeled. Cymes axillary, dichotomous, $\frac{2}{3}$ in. long, peduncle 1-2 $\frac{1}{2}$ in. long, often red. Flowers $\frac{1}{2}$ in. diam., whitish, pale, yellowish-green, says Trimen. Calyx 4-5-cleft, segments obtuse. Disk fleshy. Petals 4-5, about $\frac{1}{10}$ in. long, oblong. Stamens 4-5, short, inserted under the edge of the disk; filaments recurved. Ovary adnate to the disk. Style very short. Fruit a dry obovoid drupe, $\frac{2}{5}$ - $\frac{3}{5}$ in. long, 1-celled, 1-seeded, tipped with persistent style, mostly sterile, (reproduction chiefly by root-suckers—Kanjilal).

Flowers all the year, says Trimen.

Found in Ceylon, dry country.

Trimen :—(Singhalese) Naralu; (Tamil) piyari; Perun-Piyari.

Parts used.—The leaves, root and bark.

Use :—The powdered leaves have a powerful sternutatory action, and are used as a fumigatory to rouse women from hysterical syncope, and as a snuff to relieve ordinary headache. (S. Arjun). The fresh root-bark, when rubbed into a paste with water, is applied by the Natives to remove almost every sort of swelling (Roxb). The root is a specific against snake-bite, and the bark is used in native medicine and said to be a virulent poison. (Watt.)

N. O. RHAMNEÆ.

284. *Ventilago madraspatana*, Gaertn. H. F. B. I.,
i. 631.

Sans. :—Raktavalli.

Vern. :—Pitti (H.); Raktapita (B.); Chorgu (Hyderabad); Kroti pittu (C. P.); Lokandi, kanwail (Bomb.); Ragatarohado (Guz.); Lúri-chakka (Dec.); Pappili-chakka, suralpattai, lurala chaki, súrâte cheka, papli, vembâdain, vempadon (Triman) (Tam.); Surabi; papri Kali-bili (Dun); Bonga-Sarjom (Kol.) petli tige, lurala tige, arra chiratali (Tel); Paipli-chakka, papli, popli (Kan.); yaccaduvel (Sinhalese).

Habitat :—Western Peninsula, from the Concan southward. Tenasserim. Throughout the plains of India. Forests of Burma and Ceylon, in hot dry places.

A large, much-branched, woody climber or climbing shrub. Bark grey white. Vertical cracks, exposing the inner surface which has a vermilion colour. Wood yellow, porous, soft; branchlets elongated, slender, younger parts, branchlets, petioles and young leaves pubescent.

A very conspicuous forest climber, climbing over the tallest trees and hanging its branches down in festoons (Gamble). Tendrils woody. Leaves $1\frac{1}{2}$ -5 in. (usually about $2\frac{1}{2}$), ovate, ovate-lanceolate, obtuse or rounded at base, acuminate, obtuse or rarely acute, shallowly crenate-serrate or entire, glabrous and shining; lateral veins 6-10 in each side, fine but conspicuous, oblique, connected by very fine transverse reticulation. Petiole, $\frac{1}{4}$ in., stipules very small, lanceolate, pubescent. Flowers pale green, $\frac{1}{2}$ in., numerous, on short pubescent pedicels, arranged in clusters on the branches of large spreading and drooping, pubescent, elongated, terminal panicles. Calyx pubescent, lobes erect, very acute. Petals shorter than calyx, 2-lobed. Stamens as long as petals. Styles short. Nut small, globular, supported on persistent calyx. Wing $1-1\frac{1}{2}$ in. linear oblong, l. athery, pubescent, slightly, bifid at apex.

Part used :—The root-bark.

Uses :—The powdered root-bark is carminative, stomachic, tonic and stimulant; useful in atonic dyspepsia, debility and slight cases of fever (Moodeen Sheriff).

The powdered bark (mixed with gingelly oil) is also said to be sometimes used in South India as an external application for itch and other skin diseases (Watt).

VENTILAGO MADRASPATANA.

On treating this dye-stuff with carbon bisulphide five crystalline substances are extracted, together with a wax and a resinous colouring matter.

1. A substance of the formula $C_{16}H_{12}O_5$. This crystallises in long, orange-red needles, melting at 200° ; it sublimes at higher temperatures, partially carbonising. Its alkaline solutions have a purple tint, and the corresponding salt can be obtained in the form of violet-colored needles sparingly soluble in alcohol. There is a great deal of similarity in appearance, properties, and melting point between emodin from *Rhamnus frangula* and this substance. They are probably identical.

2. A substance of the formula $C_{16}H_{14}O_4$ (A). This forms long, colourless needles, which decompose at about 260° before melting; it is soluble in alkaline solutions with a yellowish brown coloration.

3. A substance of the formula $C_{16}H_{14}O_4$ (B). This crystallises in pale yellow needles melting at 173° . With acetic anhydride, it yields what is probably a triacetyl compound melting at $227-229^\circ$, the alcoholic solution of which has a strong blue fluorescence. It dissolves in alkalis forming yellowish brown solutions which on long exposure to air become red, and on treatment with acid yield a precipitate of emodin methyl ether.

4. A substance of the formula $C_{16}H_8O_8$. This is an orange-red, crystalline powder, which, when heated, begins to darken at 260° , and melts and carbonises at $275-280^\circ$. It is distinguished from the preceding substances by its sparing solubility in most solvents. Solutions of the alkalis dissolve it with an orange-red coloration, and it yields an acetyl derivative, $C_{16}H_7O_8$ (C_2H_5O), which crystallises in yellow needles melting and decomposing at $216-220^\circ$.

5. A substance of the formula $C_{17}H_{12}O_5$. This is a chocolate-colored, crystalline powder. When treated with dilute alkali, it dissolves with a yellow coloration, but on exposure to air the solution deposits a blue, amorphous precipitate, and it therefore appears to contain in its molecule a reduced quinone group.

6. The wax ($C_9H_{16}O$)_n, consists of nearly colourless, minute needles, melting at 72° .

7. The colouring matter is a reddish-brown, brittle resin of the formula $C_{15}H_{14}O_6$, and, up to the present, has resisted all attempts to obtain it in a crystalline condition. It softens at about 100° , and melts at $100-110^\circ$. Dilute alkalis dissolve it with a purple-violet coloration, and the corresponding salts are obtained as violet, amorphous precipitates, on adding common salts to these solutions. From its nature and properties, it appears possible that it is allied to alkanin, $C_{15}H_{14}O_4$, the colouring matter of the roots of the *Achusa tinctoria*. Alkanin is also of a resinous nature. It is possible, therefore, that the coloring matter of the *Ventilago madraspatana*, for which the name of *ventilagin* is proposed, is represented by alkanin containing two additional hydroxyl groups.—J. Ch. S. T. 1894, p. 924 et seq.

285. *V. calyculata*, Tulasne. H.F.B.I., I. 631.

Syn.:—*V. Madraspatana*, Roxb., Roxb. 211.

[King Journ. As. Soc., Bengal, Vol. 65 (1897) 379] considers this to be a variety of *V. Madraspatana*, so also does Duthie (Fl. of the Upper Gang. Plain, p. 162).

Vern.:—Rai ohani (H.); Raktapita (B.); Bonga-sarjun, dœ-saraj, noduâr (Kol.); Bonga-sarjom (Santal); Raktapita kala lag (Kumaon); Papri (C. P.); Sakal yel (Mar.); Zerra chiotali (Tel.); Karkandi châyeh; Kânyel (Bomb.).

Habitat:—Throughout hotter parts of India, from the Kumaon Himalaya and Nepal to Bhutan.

Sylhet, Tenassarim, Dun, Saharanpur. Throughout the Western Peninsula.

A large woody climber, with strong tendrils. Branchlets pubescent. Bark dark grey. Leaves 2-4 by $1-2\frac{1}{2}$ in., ovate or oblong-elliptic, more or less acute, cuneate or entire, subcoriaceous, pubescent when young; lateral nerves 6-8 pair, arcuate; base unequal; petiole $\frac{1}{2}$ - $\frac{2}{3}$ in. pubescent. Flowers numerous, small, greenish, in large terminal panicles. Calyx pubescent; lobes 5, keeled inside. Petals 5, deflexed. Disk 5-lobed, filling the Calyx-tube. Ovary 2-celled, sunk in disk. Style short, prolonged and winged on both sides in fruit. Fruit a sub-globose nut, $\frac{1}{2}$ in. diam., girt about middle by ten rims of the adherent Calyx-tube and prolonged into a wing, which is $1-1\frac{1}{2}$ by $\frac{1}{3}-\frac{2}{3}$ in., linear, strongly reticulate and with a prominent straight midrib.

Brandis says:—I follow King in uniting this with *V. Madraspatana*, *Gærtn*:—*V. calyculata*, Tulsane, is supposed to be recognized by broader leaves, rounded at the base, a pubescent disk, and half the fruit enclosed in the cup-shaped Calyx.

Parts used:—The bark and shoots.

Uses:—The juice of the bark and young shoots is, in Chutia Nagpur, applied to the body as a remedy for the pains which accompany malarial fever. A ring made from the tendril is used as a charm against toothache. (Campbell.)

286. *Zizyphus Jujuba*, Lamk. H. F. B. I., I. 632. Roxb. 204.

Habitat:—Throughout India, wild and extensively cultivated. Ceylon, dry region common. Afghanistan, China, Malay.

Sans.:—Badari.

Arab:—Sidr.

Pers.:—Kunâr.

Trimen says it is usually known in Ceylon by its Portuguese name 'Masun' (Masca, an apple).

Vern.:—Janun jan (Kol.); Ringa (Gond.); Jelachi (Kan.); Ziben (Burmese)—Brandis. Ber, baer (H.); Kul, ber (B.); Beyr, jangra (Sind); Reugha, regi, rega-panda (Tel.); Yellaude, Elandap-pazham (Tam.); Yelchi (Kan.) Jom Janum (Santal and Kol); Bar Koli (Uriya). J. Indrajî:—(Porebunder & Guj.) Bordi, Bori; (Marathi) Baher, Bor; (Hindi) Ber, Ben, Baher.

Trimen:—(Sinh) Mahâdebara; (Tamil) Ilantai.

A moderate-sized, deciduous thorny tree, almost evergreen, 30-50ft. Young branches and flowers covered with a dense fuscous tomentum. Large branches drooping, armed with stipular spines, equal, or, one straight, the other bent,

rarely unarmed. "Branchlets, petioles, underside of leaves, and inflorescence densely clothed with bright tawny or nearly white tomentum" (Brandis). "Bark $\frac{1}{2}$ in. thick, dark grey, nearly black, with irregular cracks. Wood hard, reddish; no heart-wood. Annual rings distinct, in specimens from N. India, indistinct from those in warmer regions. Pores small or moderate-sized, scanty, often oval and sub-divided. Medullary rays fine, very numerous, uniform and equidistant; the distance between two rays much less than the transverse diameter of the pores. Pores frequently joined by short, fine, concentric lines (Gamble). A very variable tree. Leaves variable. $1-2\frac{1}{2}$ by $\frac{3}{4}-2$ in., elliptic-ovate or sub-orbicular, dark green and glabrous above, covered beneath with a dense woolly pale coloured tomentum. Margin entire or serrulate. Petiole $\frac{1}{10}-\frac{3}{10}$ in. long. Flowers greenish-yellow, greenish-white, says Trimen, on short axillary cymes $\frac{3}{4}$ in. long. Calyx glabrous, white. Petals unguiculate, sub-spathulate, very caducous, reflexed; lamina oblong, concave or hooded. Disk fleshy, 10-lobed; lobes grooved. Ovary 2-celled. Style 2, united to the middle. Drupes 2-celled, fleshy and mealy, glabrous, mucilaginous when ripe and orange or red. Stone tuberculate, bony, irregularly furrowed, generally one-celled, never more than 2-celled.

Use:—The fruit is said to be nourishing (mawkish), mucilaginous, and pectoral and styptic. I think that the ripe fruit has a very agreeable taste—K.R.K. It is refreshing at any rate. Trimen says:—"The pulp has a pleasant sweetish flavour, when fully ripe. The berries are considered to purify the blood and to assist digestion. The bark is said to be a remedy in diarrhoea. The root is used in decoction in fever, and powdered to be applied to ulcers and old wounds. The leaves form a plaster in strangury (Baden-Powell.)

The young leaves are pounded with those of *Ficus glomerata*, and applied to scorpion stings in the Concan; they are also, with acacia catechu leaves, given as a cooling medicine in hot weather: dose 2 *tolás*. According to Ainslie, the root is prescribed in decoction by the Vytians in conjunction with sundry warm seeds, as a drink in certain cases of fever (Dymock).

287. *Z. glabrata*, Heyne, H.F.B.I., 1. 633.

Syn.:—*Z. trinervia*, Roxb, not Poir. Roxb. 204.

Sans.:—Vata-dalla.

Vern.:—Carookoova Kurka tura karukatá, karkattam (Tann.); Kakoopala (Tel.).

Habitat:—Eastern Bengal and Bhotan; Western Peninsula and the Nilghiri Mts.

A small, unarmed tree, youngest shoots and inflorescence pubescent. Leaves glabrous, obtusely minutely-serrate. Basal nerves prominent, continued to the apex. Secondary nerves faint; veins minutely reticulate; blade 1-3 by $\frac{2}{3}$ by $1\frac{1}{2}$ in., elliptic, glabrous on both sides, dark green. Petiole $\frac{1}{4}$ in. long. Cymes nearly sessile or $\frac{1}{2}$ in. long. Flowers slightly puberulous, yellowish, or greenish-yellow, $\frac{1}{2}$ in diam. Petals obtriangular, with convolute margins. Disk faintly 10-lobed, not pitted or grooved, glabrous. Anthers-cells parallel, not diverging at base. Ovary 2-celled; styles 2, united to the middle. Drupe globose, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, often apiculate.

Part used:—The leaves.

Use:—A decoction of the leaves is given to purify the blood in cases of cachexia, and as an alterative in old venereal affections (AINSLIE.)

288. *Z. nummularia*, W. & A., H.F.B.I., 1. 633.

Syn.:—*Z. microphylla*, Roxb. 206.

Sans.:—Bhu-hrdari-bâlakapriyâ, Aja-priyâ, Bhu-kamtaka, Sûkshma-phalâ.

Vern.:—Jhârberi (Pb.); Nundo-jangro (Sind); Malla, bér, jhari, kanta (U. P.); Parpalli (Kan.) Gangar (Guz).

Vern.:—J. Indrajî (Porebunder) Paleran, (Guj.) Adbâu bordi, Khetrâû Bordi, Jhardân Bor. Chanyâ Bor., (Mârâthi) Gaṅgar, Juṅgar Jungle bor, (Hindi) Jharberi, Jharber, Jhadia-ber.

Habitat:—The Punjab ascending to 3,000ft. Gujerat, and the Western Peninsula, from the Dekkan and the Concan southward, Persia.

A profusely-armed shrub, with widely divaricating flexuous

branches. Young branches puberulous. Leaves serrate, dark green and velvety above, pale and more felted beneath, $\frac{1}{2}$ -lin., ovate to orbicular. Cymes under $\frac{1}{2}$ in. Petals ovate, with convolute margins. Disk 10-lobed, with a pit opposite each lobe. Ovary 2-celled, styles 2, united to above the middle. Fruit $\frac{3}{8}$ in. diam., globose, woody, black, 2-celled. Much used for fencing and for the sweet subacid fruit as food, especially in famine time.

Use.—In the Punjab, the fruit is used in bilious affections; and considered by the natives to be cool and astringent (SETWART).

289. *Z. vulgaris*, Lamk, H.F.B.I., 1. 633, Roxb. 204.

Vern.:—Unnāb (Arab.); Sinjid-i-jilāni (Pers.); Titni-ber, kandiari (H.). Sanjit (Pb); Unāb (Bomb).

Habitat:—The Punjab, extending to the Western Frontier from the Punjab Himalaya. Wild and cultivated, extending to Bengal, Kashmir, Baluchistan. The best fruit (Dried) comes from China and Japan.

A large shrub or small tree, armed. Bark rough, with longitudinal furrows, dark grey. Wood pale, yellow-brown. Heartwood dark-brown, even grained. Stewart says this is the handsomest species, and that he has seen it as large as 5-6 ft. in girth and 25-30 ft. high (Gamble). Rigid, spreading boughs and stiff branches, which are often unarmed. The whole plant is quite glabrous. Leaves $\frac{3}{4}$ -2 $\frac{1}{2}$ in. sub-obliquely ovate, obtuse or sub-acute, crenate-serrate; prickles usually gemmate, the straight one often over 1 in. long, stout. Flowers few, fascicled in the axils of the leaves. Petals cucullate. Disk thin, obscurely 5-lobed. Ovary 2-celled. Styles 2, united to the middle. Fruit $\frac{1}{2}$ in. diam., globose or oblong, esculent, red and black, shining.

Use.—Mir Muhammed Husain regards the dried fruits as a suppurative, expectorant, and purifier of the blood. The bark of the tree is used to clean wounds and sores. The gum

in certain affections of the eyes, and the leaves when chewed, are said to destroy the power of the tongue to appreciate the taste of disagreeable medicines (DYMCK).

A syrup of the dried fruits is used in the Punjab for bronchitis.

290. *Z. rugosa*, Lamk., H.F.B.I., I. 636.

Syn. :—*Z. glabra*, Roxb, 206.

Vern. :—Suran, churan (Hindi); Dhaush (Oudh); Sekra (Santh.); Todali (Mal.) Mayanksi (Lower Burma.); Tabu, Mitha Tabu (Upper Burma). Toran, Churna (Bomb).

Trimen :—(Sinhalese), Maha-eraminiya, (Tamil) Churai.

Habitat :—Eastern Himalaya, 2,000ft. Behar. Shan hills to 4000ft. Sub-Himalayan tract, from the Ganges eastward, ascending to 2,000ft. Burma, South India, Western Peninsula; Ceylon, moist low country to 2,000 ft; common.

A large, straggling or climbing bush, with long virgate branches, fulvous, tomentose, when young. Leaves 2-3in., broadly oval or rotundate, unequal, sided, oblique at base, very short-acuminate, denticulate, glabrous above, densely fulvous tomentose, becoming glabrous beneath. Petiole $\frac{3}{8}$ in., prickles usually solitary, numerous, strong, broad-based, recurved or nearly straight, heavy. Flowers greenish, very small, numerous, in tomentose, pedunculate cymes about 1 in., arranged along one side of short, usually leafless, lateral branches. Calyx hairy outside, lobes ovate. Petals 0; dark, 5-lobed; styles 2, connate at base. Fruit small, $\frac{1}{4}$ - $\frac{1}{3}$ in. Drupe edible, sweet, pinkish when ripe, pyriform globose, apiculate, smooth. Stone very thin, 1-celled, 1-seeded.

Use :—The flowers, with an equal quantity of the petioles of the betel leaf and half as much lime, are given in 4-grain pills twice a day for menorrhagia (DYMCK.)

291. *Rhamnus dahuricus*, Pall., H.F.B.I., I. 639.

Syn. :—*R. Virgatus*, Roxb. 203.

Vern. :—Chato, chedwala, chadua (H.); Tsápo, mail (Tibet); Spiti (Kumaon); Phipai, dádúr tadru, setapajja, hangi, mamral,

shomfol reteon, gogsa, sindool, mûtûi, mor, chakra, romúsk, thalot, chetaín (Pb.); Wurak (Pushtu).

Habitat :—Trans-Indus Himalaya 2,400-7,000 ft., from the Indus eastward; Manipur, Shan Hills, Upper Burma, 4,000 ft.

A spinescent large shrub, or small tree; heart-wood brown, hard, possessing wavy radial belts; branches often spinescent, young shoots pubescent. Leaves membranous, almost opposite, glabrous, frequently fascicled or arrested branchlets, lanceolate, or obovate-lanceolate, blade 1-4 in., petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers greenish, on slender pedicels, in axillary clusters; 4-merous; petals, minute, linear, spatulate. Fruit obovate, orbicular, $\frac{1}{2}$ in. long. Seed grooved, groove narrow, nearly closed. Closely allied to the European *R. Catharticus* (Lowson).

Part used :—The fruit.

Use :—The fruit which is bitter, even when ripe, has emetic and purgative properties, and is given (Trans-Indus) in affections of the spleen, (WATT.)

Closely allied to the European *R. Catharticus* for which it may be used as a substitute in India. (B. D. B.)

292. *R. Wightii*, W. and A., H.F.B.I., I. 639.

Vern :—Rakta-rohida, Rakt zorar (Bom.).

Habitat :—Western Peninsula, and from the highest hills of the Concan southwards to the Nilghiris. There is a fine tree in Thana Judge's garden. Common in Upper Montane Zone, Ceylon.

Brandis says: "It is found on the Western Ghats, from Mahabaleshwar southwards; Nilgiris, Palm Hills.

A large shrub, young parts puberulous. Leaves 2-3 $\frac{1}{2}$ in., ovate-oval or ovate, rounded at base, acuminate, obtuse, apiculate, finely glandular-serrate, glabrous on both sides. Petiole $\frac{1}{2}$ in.; Stipules very early caducous. Flowers yellowish green, on glabrous pedicels, shorter than the petiole, 1-5 in. axillary clusters. Calyx glabrous; segments 5, triangular. Petals 5, very small, spatulate. Stamens 5; ovary 3 (or 4)-celled; Styles 3-(or 4), connate half way up. Berry $\frac{1}{4}$ in. globose, supported on flat persistent Calyx-tube, tipped with persistent styles, smooth, reddish purple.

Trimen says it is nearly allied to *R. frangula*, the Alder buck-thorn of England.

Use :—In the Western Peninsula the bark is in much repute on account of its tonic, astringent and deobstruent properties (DYMOCK.)

293. *R. purpureus*, Edgew, H.F.B.I., I. 639.

Vern. :—Bal sinjal, káru, memarira, Kinji (Pb.).

Habitat :—West Himalaya, from Murree to Kumaon, Indus to Sard river 4500 p. 10,000.

An unarmed, middle-sized tree, young shoots pubescent, the previous year's branchlets purple. Leaves alternate, ovate-lanceolate, acuminate. Secondary nerves 6-10 pair, prominent, blade 3-4 in. Petiole $\frac{1}{4}$ in. Flowers mostly bi-sexual, 5-merous, in axillary clusters or Cymes. Petals 0; style short, 3-cleft nearly to the base. Drupe $\frac{1}{4}$ to $\frac{1}{2}$ in. long, sub-globose, bitter.

Use :—In Hazára the fruit is used as a purgative (STEWART).

294. *R. triqueter*, Wall, H. F. B. I., I. 639.

Vern. :—Rangrek (Pb.) Lhish Jaunsar.

Habitat :—Punjab, in the Salt Range; Western Himalaya, from the Jhelum, alt. 3-4,000 ft., to Kumaon. Lanowla, Purandhar Hill, in the Poona District.

A small tree. Branchlets and leaves, with dense short tomentum. Leaves ovate or elliptic-oblong. Secondary nerves 6-10 pair, prominent. Blade 2-5 in., petiole $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Flowers clustered on axillary racemes attaining 3 in., puberulous, fascicled on the leafless (very rarely leafy) branches. Fruit $\frac{1}{2}$ in., obovoid, 3-lobed. Seeds, with a broad open groove.

Use :—Talbot writes that "it is very like *R. Wightii*, and may have been formerly cultivated in the Deccan for its medicinal qualities" (Forest Flora, p.30).

295. *Gouania leptostachya*, D.C., H.F.B.I., I. 643.

Vern. :—Batwasi, tung-cheongmourik (Sikkim.)

Habitat:—(Brandis) Sub-Himalayan tract and outer hills from the Jumna eastward, ascending up to 6,000 ft. in Sikkim. Khasi Hills, Lower Burma, Andamans. Tonkin, Cochin China, Malay Peninsula and the Archipelago.

An unarmed, climbing shrub; branches glabrous; leaves 3-4 by 1½-2 in., ovate, acuminate, slightly cordate at the base, coarsely crenate-serrated, glabrous: racemes interrupted, axillary or in terminal panicles, elongated, pubescent when young, afterward glabrous. Flowers on very short pedicels, polygamous. Disk glabrous, stellate; accessory angles partly adnate to the calycine-lobes, free and acuminate towards the 2-horned apex. Fruit glabrous, shortly winged.

Use:—The leaves are used by Lepchas to make poultices for sores (GAMBLE.)

N. O. AMPELIDÆ.

296. *Vitis quadrangularis*, Wall., H.F.B.I., I. 645.

Syn.:—*Cissus quadrangularis*, Linn. Roxb. 136.

Sans.:—*Asthisanhari*, vajravalli.

Vern.:—Harshankar, harjora, kándawel, Mhoisvel, nallar, Khárbuti H. and Bomb.); Hâd Sânkâl, Hadsankal (Porebander and Guj.); Pirandal (Tam.); Nulle rotigeh, Nallera (Tel.); Tsgangelamparenda (Mal.). Hiressa (Singhalese).

Habitat:—Throughout the hotter parts of India, from the foot of the Western Himalayas in Kumaon to Ceylon and Malacca. Malay Peninsula, Java.

Stems very long, not woody, thick, sharply compressed, quadrangular but scarcely winged, the sides concave, much branched, jointed by contractions at the nodes, glabrous, green, fleshy, the younger ones square on section and with winged angles. Tendrils long, slender, simple. Leaves distant, few, 1-2 in., broadly ovate or rotundate-deltoid, truncate at base, very obtuse, distantly spinous-crenate, glabrous, thick. Petiole ¼-½ in., sub-quadrangular; stipules small, in small umbels on branches of short paniculate cymes. Petals ovate, acute. Style short, blunt. Berry globose, apiculate, red.

Parts used:—The stalk and leaves.

Use.—The leaves and young shoots when dried are powdered and given by the Tamool practitioners in certain bowel affections connected with indigestion; they are also considered as powerful alteratives (AINSLIE).

The juice of the stem is dropped into the ear in otorrhœa, and into the nose in epistaxis by the Marâthâs. It has also a reputation in scurvy and in irregular menstruation (DYMCK).

Trimen :—"An article of food, both fried and curried."

The stem beaten into a paste is given in asthma (BALFOUR).

A preserve of the stem prepared by boiling it in lime water is a useful stomachic (MOODEEN SHERIFF.)

297. *V. adnata*, Wall. H.F.B.L., I. 649.

Syn.—*Cissus adnata*, Roxb. 136.

Vern.—Kole-Zân (Bom.); Bod-lar-nari (Santal); Panilari (Paharia); Kungchen-rik (Lepcha); Gudametige, kokkitaya-ralu (Tel); Nâdena (Mahâbaleshwar) Marâthi. This is the name in the Concan. Thâna District—K. R. Kirtikar.

Habitat.—Hotter parts of India, from the Western Himalaya in Garhwal to Assam, Sylhet and Bengal. Western Peninsula and Ceylon.

Stems slender, cylindric, at first covered with orange tomentum, afterwards glabrous. Tendrils forked, woolly. Leaves 2-3 in., broadly ovate, cordate or wide-truncate at base, shortly acuminate, acute, spinous-serrate, nearly glabrous above (when full-grown), densely covered with orange tomentum beneath. Petioles about lin., very tomentose. Stipules broad, obtuse, membranous, hairy. Flowers on slender, hairy, rather drooping pedicels. Cymes paniculate, orange-tomentose; peduncles exceeding the petioles. Berry $\frac{1}{4}$ in.; black, on recurved stalk, pyriform, appendiculate. Tendril woody, says Lawson. Seed $\frac{3}{10}$ in., pyriform, smooth.

Parts used.—The tubers and roots.

Use.—The dried tubers are used by the country people as an alterative, in the form of a decoction; they consider that

it purifies the blood, acts as a diuretic, and renders the secretions healthy (DYMCK.)

The root, powdered and heated, is applied to cuts and fractures by the Santals (Rev. A. Campbell.)

298. *V. latifolia*, H.F.B.I., I. 652, Roxb. 222.

Vern. :—Pâni-bel, musal (Merwara); Govila (B.) Jungli Drakh (Porebander and Guj.); Golinda (Marâthi).

Habitat. North-West India; Kumaon and Moradabad. Assam, Silhet and the Western Peninsula, from the Concan and Coromandel coast, southwards.

The whole plant quite glabrous generally. Stems weak, hollow, far-climbing, striate. Leaves 5-8 by 6-8 in., glossy, roundly-cordate, 3-7-angled or-lobed, peduncles shortish, bearing a slender forked tendril. Flowers very small, in small, somewhat compact, thyrsoïd Cymes, reddish-brown; petals distinct; peduncles bearing a short, wiry tendril a little below the cyme. Style 0. Fruit of the size of a current, black, 2-seeded. Seeds $\frac{1}{8}$ - $\frac{1}{4}$ in., elliptic, with a linear tubercle on the back and the margins transversely rugose, bluntly ridged on the face.

Use.—According to Royle, the roots (Kusar) are used medicinally (Royle. Ill., p. 144.)

299. *V. vinifera*, Linn. H.F.B.I., I. 652.

Sans.—Drākshā; mridirkā.

Vern.—Of the fresh fruit—Grapes, *Eng.* Angûr, Dâkh, *Hind.* Angûr, *Duk.* Kodi-mundrip-pazham, Dirāksha-pazham or Dirāksha-param, *Tam.* Drāksha-pandu, Gostini-pandu, *Tel.* Muntirinnap-pazham or Muntri-param, *Malyal.* Drākshi-hannu, *Can.* Angûr, Drākhyâ, *Beng.* Drāksha-phalam, *Sans.* Drāksha, *Mah.* Drâkh, *Guz.* Mudra-palam, Mudrakâ, *Cing.* Sabî-si Sabya-si, *Bur.* Ainab or Aanab, *Arab.* Angûr, *Pers.* Of the ripe fruit, dried in the sun or with artificial heat—Monaqqâ, *Hind., Duk. and Pers.* Ularnda-dirāksha-pazham or Ularnda-drâcha-param, *Tam.* Endu-drāksha-pandu, Dîpa-draksha-pandu, *Tel.* Unanniya-muntrinap-param, *Malyal.* Dîpa-drakshi, *Can.* Monakkha, *Beng.* Vellich-cha-mudra-palam, *Cing.* Zabibmavéz,

Arab. Of the small variety of raisins without stones—Sultâna Raisins, *Eng.* Kishmish, Bédânah, *Hind.*, *Duk.* and *Pers.*

Habitat.—Wild in the N. W. Himalaya; cultivated extensively in N. W. India and rarely in the Peninsula as Poona and Nasik.

A large, woody climber; tendrils long, bifid. Leaves simple, glabrous above, clothed beneath with grey floccose deciduous tomentum, from a cordate base nearly orbicular, more or less deeply 5-lobed, edge cut into large unequal, acute teeth; basal nerves 5, the midrib with 4-5 pair of prominent secondary nerves, petioles generally shorter than leaf, longer than half its length. Flowers green, fragrant, petals cohering at the top. Inflorescence usually on the tendrils. Cymes arranged in panicles. Fruit 3-5-seeded.

Use.—The dried fruits, called raisins, are used in medicine. They are described as demulcent, laxative, sweet, cooling, agreeable and useful in thirst, heat of body, cough, hoarseness and consumption (Durr).

Mahomedan writers consider grapes and raisins to be attenuant, suppurative, pectoral and the most digestible of fruit, purifying the blood and increasing its quantity and quality. The ashes of the wood are recommended as a preventive of stone in the bladder, cold swellings of the testes and piles. The juice of the unripe grapes is used as an astringent. The modern Italians use the juice in affections of the throat (Dymock).

The leaves, on account of their astrigency, are sometimes used in diarrhoea.

In modern native practice, the raisins are considered cool and aperient, and given in coughs, catarrh and jaundice (Mookerji).

Grapes are refrigerant, diuretic and antipyretic. In large doses, raisins act as a demulcent, expectorant and laxative, and in smaller ones as an astringent.

The *sherbet* or syrup of grapes is a very pleasant and cooling drink, and proves very useful in relieving thirst and other pyrexial symptoms in many forms of fever. I have also used

it with advantage in ardor-urinæ, dysuria, strangury and some cases of bilious dyspepsia. It is one of the best and most agreeable vehicles for other medicines, particularly those used in dyspepsia, dysentery, diarrhœa, and dropsical affections. From their combined actions of demulcent, expectorant and laxative, raisins are a frequent ingredient in Mohamedan prescriptions for catarrhal and febrile complaints. They enter into the composition of Tinctura Cardamomi Composita and Tinctura Sennæ. They also form an ingredient in one of my own formulæ for certain forms of fever. There is little or no difference between the medicinal properties of the common variety of raisins and those of the small ones without stones (MOODEEN SHERIFF.)

300. *V. indica*, Linn. H.F.B.I., I. 653.

Vern.:—Amdhauka, Amulka (B.); Jangli angûr (H. and Dec.); Sambara or shembara-valli (Tel.) Chempara-valli (Malyal.); Randraksha, kole-jan (Mar.); Pâlkanda (Konk.) To-wel, Rata-bulatwel (Sinhalese).

Habit:—The central tableland of India, the Western Peninsula and Bengal. Ceylon most low country, up to 2,500 ft.

Stems slender; permanently woolly-tomentose branches, leaves and peduncles. Leaves 4-10in., coriaceous, at length glabrous and shining above, cordate-obovate, acute, denticulate-serrate, the points of the serratures hard almost to spiny. Peduncles stoutish, bearing a long, simple or bifurcated tendril (K. R. K). Flowers greenish-purple, nearly sessile, in short cylindrical spikes, about 2 in. Petals distinct; rhomboid-ovate. Style O. Fruit globose, the size of a large currant or pea, 2-4 seeded. Seed $\frac{1}{2}$ by $\frac{1}{4}$ in., elliptic, slightly curved on the back, from end to end, otherwise flattish, with a spatulate tubercle, the face wedge-shaped.

Use:—According to Rheede, the juice of the root, with the kernel of the cocoanut, is employed as a depurative and aperient.

In the Concan, the country folk use it as an alterative in the form of a decoction, and they consider it to purify the blood and act as a diuretic and render the secretions healthy (Dymock.)

301. *V. setosa*, Wall. H.F.B.I., I. 654.

Syn. :—*Cissus Setosa*, Roxb. 137.

Vern. :—Barn-butsali, barre bach-chali, warsi pala, pulla bach-chali (Tel.); Harwal (H.); Yek-gisam-ka-bachla (Dec.); Khāj goli-cha vel (Mar.); Puli-pêrandai; puli-naravi; Anuittad-bêlichal (Tam.)

Habitat :— Western Peninsula, from the Circars and Mysore southwards. Ceylon.

Stems prostrate, weak-branched, succulent, zigzag, striate, hispid, with glandular hairs. Tendrils long, forked. Leaves 3-foliate (rarely simple), sessile. Leaflets shortly stalked, obovate or oblong-cuneate at base, obtuse, irregularly toothed or lacinate, succulent, glabrous above, glandular-hispid on the veins beneath, pale green, the central one narrower and on longer stalk. Stipules broad ovate, acute. Flowers small on long glandular pedicels. Cymes terminating lateral branches, dichotomous, lax, divaricate. Peduncle $1\frac{1}{2}$ -4 in. long, glandular-hispid. Calyx loose, truncate. Petals contracted in the middle, hooked, ultimately reflexed. Berry over $\frac{1}{4}$ in., ovoid, strongly glandular-hispid, scarlet, size of a pea. Seed sub-globose, nearly smooth. The fruit is acid at first to taste, but afterwards very burning and acrid. In fact, every part of the plant is exceedingly acrid, says M. B. Lawson in Hooker's Flora. Br. Ind.

Parts used :—The leaves.

Use :—It is exceedingly acrid. The leaves are sometimes externally applied as a domestic remedy to promote suppuration and assist in the extraction of guinea-worm (DYMCK).

It is a useful local stimulant, in the form of a poultice (MOODFEN SHERIFF).

302. *V. trifolia*, Linn. H.F.B.I., I. 654, Roxb. 137.

Syn. :—*V. Carnosa*, Wall.

Sans. :—Amla-parñi.

Vern. :—Amal-bel, gidad-drâk, kassar (H.); Bundal, amal-lata, sone-kesur (B.); Jarila-lara (Paharia); Takbli-rik (Lepcha);

Maimati (Assam); Kârik, âmal-bel, gidardâk, drikri, vallur (Pb.); Odhi, ambat-vel (Mar.); Khât-khatumbo, tâmânya (Guz.); Kuru dinne, kâdepa tige, kanapatige, mandulamari tige, meka mettani chettu (Tal.) Walratdiyabalu (Sinhalese).

Habitat :—Throughout the hotter parts of India and ascending into the tropical Himalaya. Ceylon.

Stems slender, much-branched, angular, quite glabrous. Tendrils long, slender, wavy, branched, and opposite the leaves. Young shoots glabrous, red. Leaves 3-foliate, 2-6 in., on long peduncles, channelled above. Leaflets small, usually shortly stalked, the middle one the largest and on longer stalk, broadly oval or rotundate, rounded at base, acute or obtuse, very coarsely crenate-serrate, glabrous and shining, thick. Stipules small, ovate, acute. Flowers white, green, says Trimen, shortly pedicellate. Cymes di-or-tri-chorotomous, lax, divaricate, terminating lateral branches. Peduncle $2\frac{1}{2}$ -3 in., glabrous, petals acute, spreading. Berry $\frac{3}{4}$ in., or more, depressed-globose, smooth, purple, 3-or 4-seeded, very juicy. Seed acutely trigonous, sharply pointed, bluntly muricate on beak, wedge-shaped on the face.

Parts used.—The seeds and roots.

Use.—The names given to it in many parts of India denote one of its most general uses, *viz.*, the treatment of yoke sores on the necks of bullocks. For that purpose, a poultice of the leaves is employed (Elliot). According to Irvine the seeds and also leaves are employed as an embrocation. Stewart remarks that the root, ground with black pepper, is applied to boils. The root—Kâmrâj (H.) is used as an astringent medicine.

303. *V. araneosus*, Dalz. & Gibs. H.F.B.I., I. 657.

Vern. :—Bendir, bender-wel, ghorwel (Bom.). The root—Chamarmusli (Bomb.)

Habitat :—Western Peninsula, highest ghats of the Concan and Pulney Mts. Grows very freely in Thana, and is called Bendri.

The whole plant covered with deciduous down, except on the under-surface of the leaves where it is persistent. Stems flattened, slender for climbing. Leaves membranous, 4-6 in. petiole 1-2 in.; terminal leaflet elliptic, lateral semi-elliptic, shortly stalked, serrate, at length glabrous above, felted beneath. Flowers dark brown or red, in small compact umbellate cymes, on long woolly peduncles, which bear a forked tendril about an inch from the top. Style very short. Fruit globose, of the size of a currant, black, 3-4-seeded. Seeds $\frac{1}{8}$ by $\frac{1}{8}$ in., elliptic, with a round depression on the back, puckered round the margins.

Use.:—The vine is often given to horses when it first springs up; it is said to be very beneficial once a year. The tuberous, starchy, astringent roots, sliced and dried, are sold by the Concan herbalists, under the name of Chamar-musli (DYMCK).

304. *V. pedata*, Vahl. H.F.B.I., I. 661, Roxb. 138.

Sans.:—Godhâpadi (foot of the Iguana, from the shape of the leaf).

Vern.:—Goali-latâ (B.); Tungrûtrikup (Lepcha.); Edakula, mandula, kaunem, pulimâdâ, kâniâpatige, kâdepatige (Tel.); Ghorpad-vel (Mar.); Mediya-wel (Sinhalese).

Habitat:—Bengal, Sylhet, Assam, Khasia Hills and the Western Peninsula, from the Concan to Ceylon.

A large climber. Stems weak, cylindric, striate, usually covered with short pubescence, mixed with longer, brown, spreading hairs; tendrils long, forked, very slender, young parts tomentose. Leaves large, 3-foliate (Trimen), usually 7-foliate (M.A. Lawson); the lateral leaflets usually pedately-compound. Petiole 2-3 in., pubescent and hairy, like the stem, central leaflet long-stalked, lateral leaflets shortly stalked, rarely simple, usually divided into 2-3 or 4 leaflets which are unequal, nearly sessile or shortly stalked, all leaflets acute and often oblique at base, shortly acuminate, acute, coarsely and shallowly

repand-dentate, more or less pubescent on both sides, especially beneath. Flowers white, bi-sexual, on short pubescent pedicels. Cyme corymbose, shortly pedunculate, dichotomous, lax, spreading, axillary, shorter or longer than petiole. Calyx very shallow, segments usually 4 (rarely 5); hooked and slightly coherent at top, pubescent outside, soon falling. Berry $\frac{1}{2}$ in, depressed, globose, cream-coloured, 2-4-seeded. Seed semi-globose, smooth.

Use :—Sometimes used as a substitute for, or adulterant of, *V. setosa*.

This plant is used as a domestic medicine, because of its astringency (DYMOCK).

305. *Leea macrophylla*, Roxb. H.F.B.I., I. 664, Roxb. 291.

Sans. :—Samoodraka.

Vern.—Dhol-shumoodra (B.); Dindâ (Bomb.); Samudraca (H.); Hatkan (Santal); Dinda (Mar.).

Habitat :—Throughout the hotter parts of India, from the tropical Himalaya, as far west as Kumaon, to Bengal, Assam, and the Western Peninsula.

Stems erect, flexuose. Leaves simple, 9in., 2-fid, broadly ovate, sub-cordate at base, coarsely serrate or dentate or sub-lobed, repand, glabrous and dark green above, nearly white beneath, and pubescent, with minute-branching hairs. Cymes puberulous, 1-ft. or more, freely-branching. Flowers white, small. Fruit the size of a small cherry, smooth, black, succulent.

Part used :—The root.

Uses :—The tuberous root is employed in the cure of guinea-worm, and when pounded is applied to obstinate sores to promote cicatrization. According to Roxburgh, the root is astringent and a reputed remedy for ringworm (DYMOCK).

The root is said to yield colour for dyeing.

In Chutia Nagpur, it is supposed to have anodyne properties, being applied externally to allay pain (Revd. A. Campbell).

The Burmans use the root as an application to wounds to stop the effusion of blood (MASON).

306. *L. crispa*, Willd. H.F.B.I., I. 665, Roxb. 220.

Vern. :—Ban-chelta (B.) ; Nalugu (Malay).

Habitat :—Sikkim, Terai, Assam Khasi hills, Dacca, Chittagong, Lower Burma, Concan, North Kanara.

A stiff shrub. Leaves usually quinate-pinnate, stems, branches and petioles generally with 6-8 narrow crispid wings, nearly glabrous ; leaflets usually 5, oblong, 4-12 in. by $1\frac{1}{2}$ - $3\frac{1}{2}$ in., deeply and irregularly serrate ; secondary nerves numerous, prominent beneath, straight, parallel one to each serration ; tertiary nerves indefinite, parallel. Corymbs stoutish, small ; bracts minute. Anthers distinct. Fruit the size of a cherry, black, succulent. The crisped, winged stems and petioles, says Lawson, give to this plant a most elegant appearance.

Use :—The tubers are used as a remedy for guinea-worm, and are said to be more efficient than those of *L. macrophylla* (DYMCK).

The leaves, when bruised, are employed in Bengal as an application to wounds. (Revd. J. Long).

307. *L. sambucina*, Willd. H.F.B.I., I. 666, Roxb. 221.

Vern.—Kukur-jihwa (H. and B.) ; Dino (Goa) ; kar-kani (Mar.) ; Aukados (Tel.) ; Nalûgu (Mal.). Burulla guralla (Sinhalese).

Habitat.—Throughout the hotter parts of India. Ceylon.

A shrub, with straight branches. Leaves pinnate or tripinnate, often $3\frac{1}{2}$ by 4 ft. ; leaflets stalked, very variable in size and shape ; nerves arcuate. Flowers greenish-white. Anthers connate. Fruit dry, the size of a small dry cherry.

Parts used :—The root and leaves.

Use :—According to Rheede, a decoction of the root is given in colic, and it is cooling and relieves thirst.

In Goa, the root, called *ratanhia* by the Portuguese, is much used in diarrhoea and chronic dysentery. The roasted leaves are applied to the head in vertigo. The juice of the young leaves is a digestive. In Reunion, the root is called *Bois de Surreau*, and is said to be used as a sudorific (DYMOCK).

308. *L. robusta*, Roxb. H.F.B.I., I. 667, Roxb. 220.

Vern :—Gino (Goa, ; Haramada, hatkan (Santal) ; Gabui (Nepal) ; Pantom (Lepcha).

Habitat :—Sikkim Himalaya and Khasia Mts., Western Peninsula and the Northern Circars. Kolaba, Mirya Hill, Ratnagiri.

A large, robust shrub, 5-6 ft. Stems stout, the older parts glabrous, the young covered with harsh, coarse, short pubescence. Leaves 2-3-pinnate, pubescent, 1-3 ft. long, often broader leaflets 6-12 by $2\frac{1}{2}$ -6 in. ovate or ovate-lanceolate, cuspidate, serrate, glabrous above, pubescent on the veins beneath. Bracts large, persistent, $\frac{1}{2}$ -1 in. lanceolate. Flowers larger than in the other species. Cymes compact. Flowers larger than in the other species. Anthers connate. Fruit black, succulent, the size of a small cherry.

Uses :—In Chutia Nagpur, the soft and fleshy root is applied externally as an anodyne, and is also given to cattle for diarrhoea (Rev. A. Campbell).

309. *L. hirta*, Roxb. H.F.B.I., I. 668. Roxb. 220.

Syn :—*Leea arguata*, Linn.

Sans :—Kakajanghâ.

Habitat :—Sikkim Himalaya, ascending too 2,000 ft., Assam, Vilhasi hills Silhet, the Khasia Mts., Sundarban, East Bengal,

and Chittagong. Pegu and Andaman Islands. Forests near Karwar.

A shrubby evergreen, with coarse, scabrous branches and petioles. Leaves hairy; leaflets 4-12 by 2-4 in., lanceolate or ovate-lanceolate, acuminate, serrate, harsh and scabrous above, hairy beneath, veins arched. Cymes very short and compact, 2-5 in., densely hirsute. Bracts inconspicuous. Flowers large, anthers connate. Fruit the size of a pea, black when ripe.

Use.:—It is used medicinally. The tubers and stems are probably astringent and mucilaginous.

N. O. SAPINDACEÆ.

310. *Cardiospermum helicacabum*, Linn.
H.F.B.I., I. 670, Roxb. 335.

Eng.:—Balloon-Vine, Heart Pea or Winter Cherry.

Sans.:—Jyotishmati, Kâravi.

Vern.:—Latâphatkari, nayâphatki, noaphutki, sibjhûl (B.); Hab-ul-kal-kal (seed) (Pb.); Karolio (Guz.); Kânphuti, bodhâ, khibjal, Naphat (Bom.); Mûda-cottan (Tam.); Walla gûlisienda, kanakaia, bûdha-kakara (Tel.); Penel-wel (Sinhalese); Kâgdolio (Porebunder).

Habitat.:—Throughout India, chiefly in Bengal and the North-Western Provinces. Ceylon, Malacca.

A sub-scandent annual. Stem slender, strongly furrowed, slightly branched, glabrous, young parts puberulous. Leaves biternate. Petiole long, 2-3 in., spreading or deflexed, furrowed. Leaflets sessile or shortly stalked, ovate, tapering at base, acute, deeply incised-serrate, glabrous, thin, flaccid. Flowers very small, $\frac{1}{2}$ in., on slender pedicels 3-7 in., a very small cyme, terminating to stiff, slender, horizontal, axillary peduncle 4 in., long, and provided beneath the cyme with 2 opposite reflexed, circinate or hooked tendrils. Sepals rounded, the outer pair very small. Petals rounded, scarcely clawed; scales of upper ones emarginate. Style very short. Capsule on a short, slender stalk, bladder-like, $\frac{1}{2}$ - $\frac{3}{4}$ in. wide, depressed-pyriform, trigonous,

truncate at top, winged at the angles, valves papery, veiny, finely pubescent. Seeds $\frac{1}{8}$ - $\frac{1}{4}$ in., globular, glabrous, black, the aril heart-shaped, white.

Parts used :—The roots, leaves and seeds.

Uses :—The Sanskrit writers describe the root as emetic, laxative, stomachic and rubefacient. Combined with other medicines, they prescribe it in rheumatism, nervous diseases, piles &c. The dried leaves are said to bring on the secretion of the menses (Dutt). The seeds are officinal; and the root is considered by the native practitioners diaphoretic, diuretic and aperient. It is mucilaginous, and imparts this property to water, rendering it nauseous, and is thus administered in fevers. Rheede says that on the Malabar Coast the leaves are administered in pulmonic complaints. According to Ainslie, the leaves mixed with castor oil, are employed internally in rheumatism and lumbago.

The whole plant rubbed up with water is applied to rheumatism and stiffness of the limbs. The leaves, mixed with jaggery, and boiled in oil, is a good specific in sore-eyes (RHEEDE).

The whole plant, steeped in milk, is successfully applied to reduce swellings and hardened tumours (DRURY).

In the Punjab, the seed is used as a tonic in fever, and a diaphoretic in rheumatism (BADEN POWELL).

The juice of the plant promotes the catamenial flow during the menstrual period. It is also a demulcent in gonorrhœa and in pulmonary affections (BADEN POWELL).

The Hindu practitioners in South India, especially those in villages, frequently employ the leaves and root of *C. helicacabum* in the treatment of several diseases, including rheumatism, gravel and calculi; but I have only seen the juice of the leaves, in about three-ounce doses, producing a good and satisfactory result in two cases of acute rheumatism. In each of these cases, the drug acted upon the bowels and produced four or five loose motions, but the relief it afforded to the pain and other symptoms of rheumatism was distinctly more than that

generally observed in the same disease under the use of ordinary purgatives. This is the chief cause of my including the above plant in this work (MOODEEN SHERIFF).

311. *Æsculus hippocastanum*, Linn. H.F.B.I.,
I. 675.*

Eng. Horse-chestnut.

Vern :—Pû (Pb.).

Habitat :—Found in India only in a state of cultivation.

North America, Temperate Asia, Asia Minor; Central Asia.

Large trees, often reaching 50-60 ft., with a broad pyramidal outline or shrubs. Trunk erect. Leaves opposite ex-stipulate, digitately composite; leaflets 7, broad, unequal in size, serrate. Flowers irregular, polygamous, interterminal, more or less elongate, branched cymiferous racemes. Cymes often 1-parous. Lobes of gamophyllous tubular Calyx 5, unequal, imbricate. Corolla snowy white, dashed with pink and yellow, inodorous. Petals 5, or, the 5th place vacant, 4, unequal unguiculate; claw linear, compressed or canaliculate; limb in-appendiculate, imbricate. Stamens 5-8, subcentric; filaments free, interior to annular or unilateral disk. Sub-hypogynous, erect or arcuately declinate. Anthers introse, 2-rimose, dehiscent by two longitudinal clefts. Germen (in male flower rudimentary) sub-centric, sessile, 3-locular, the ovular coat is double. Style terminal, elongate, apex stigmatose, simple. Ovules in cells 2, inserted in the internal angle; one ascendent; raphe ventral; the other descendent; raphe dorsal. Fruit capsular, 3-locular, smooth or more rarely echinate, coriaceous, globose or sub-3-lobed, loculicidal, cells, 1-3, 1-2-spermous. Seeds sub-globose; hilum large. Testa smooth, coriaceous, exarillate. Cotyledons of ex-albuminous embryo thickly fleshy, hemi-spherical, conferruminate. Radicle arched, more or less sheathed within the testa. The pollen is ellipsoid.

* In Hooker's F. B. I., contributor W. P. Hiern says, at p. 675; "the *Æsculus Hippocastanum*, Linn, is said to be indigenous in North India, but it is not now known in the wild state (1875 A. D.)"—K. R. K.

In 1874-1877 I used to see a row of some excellent, huge, handsome horse-chestnut trees along the garden enclosing wall of the Kensington Gardens, London (K. R. K.)

Uses:—The fruit and bark have for long been regarded as useful in the treatment of fevers as an anti-periodic. Esculine, in doses of 15 grains, is said to have been found useful in malarial disorders.

Composition of the fruit, after drying. Shell=16.9%, kernel=83.1%. The kernel, shell and whole fruit, resp., show on analysis: ash 2, 8, 1.7, 2.6; protein, 12.1, 5.7, 11.0; fiber, 2.1, 15.2, 4.0; oil, 6.3, 0.9, 5.3; carbohydrates, 74.5, 71.6, 74.0. The ash contains 12.3% P_2O_5 . This nut contains no harmful ingredient, but the relatively large proportion of bitter acid present renders the material unpalatable. When ground and mixed with molasses these nuts have been used as a substitute for oil-cake in cattle fodder. Drying, macerating, or boiling the nuts greatly reduces the bitter taste and increases the nutritive value. One kg. of dried nuts is equivalent to 6 kg. of beet-roots. Numerous methods are employed in separating the starch of chestnut. Horse-chestnut oil is very similar to almond and mustard seed oils. The following consts. were obtained: d_{15} , 0.926; n , 1.4747; Sapon. no., 194.5; I no, 95.4; R—M. no, 1.54; Hehner no., 92.9; acetyl no, 13.5. The acid principle of this nut has not been clearly identified.

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312. *Æ. indica*, Colebr. H.F.B.I., I. 675.

Eng.:—Indian horse-chestnut.

Vern.:—Bankhor, gugu, kanor, pankar (H.); Gun, kanor (Pb.); Kishing (Kumaon); Home, banûdûm (Kashmir); Torjaga (Trans-Indus).

Habitat:—Western Himalaya, from the Indus to Nepal.

A large, deciduous tree, with scaly sticky, buds. Bark grey; when old, exfoliating upwards in long flakes or thin bands, which remain attached to the upper ends and hang down outwards, having a straight appearance. Wood white, with a pinkish tinge, soft, close-grained. A very handsome tree, reaching 100 ft. or more in height, in suitable places, with perhaps 25 ft. in girth. Leaves opposite, digitate, ex-stipulate; common petiole 4-6 in. long. Leaflets 5-9; 6-10 by 2-3½ in., the centre ones the largest, oblanceolate, or oblong, acuminate, sharply

serrate; lateral nerves 15-22 pair, arcuate; base acute. Petiolules $\frac{1}{2}$ -1 in., long. Bud scales about $1\frac{1}{2}$ in. long, membranous, caducous. Flowers white, horizontal, in large thyrsoïd, cyme-bearing, terminal panicles. Calyx $\frac{1}{5}$ - $\frac{1}{3}$ in. long, tubular, with 5 short, rounded lobes, often split longitudinally in open flowers. Petals 4, the place of the 5 usually vacant, white and yellow, $\frac{3}{8}$ - $\frac{4}{8}$ in. long, clawed, unequal in breadth. Stamens 7 filiform, curved upward, longer than the petals; anthers variable. Disk one-sided. Ovary sessile, 3-celled; style simple, sessile, slender. Fruit a 1-3-celled. Capsule, $1\frac{1}{2}$ in. long, ovoid, rough outside. Seeds ex-albuminous, about $1\frac{1}{4}$ in. diam. dark brown, smooth, shining. Hilum about $\frac{1}{2}$ in. diam.

Use.—The fruit is used for horses in colic. It is also applied externally in rheumatism; for this purpose the oil is generally extracted from the seeds (WATT).

313. *Schleichera trijuga*, Willd., H. F. B. I., I. 681, Roxb. 331.

Vern.—Kosum, kusum, gausam, (Hind.); Puvatti, (Kaders.); Baru, (Santali; Kol.); Kosum, kohan, kosimb, peduman, (Mar); Kosum, kocham, kosumb, gosam, assumar, (Guj.); Komur, pusk, (Gond.); Rusam, (Uriya); Kussam, kojba, (C. P.); Samma, jamoa, gausam, kussumb, (Pb.); Pava, pu, pulachi, zolim buriki, pumarum, pularari, puva, (Tam.); Pusku, posuku, pusi, may, mayi, rotanga, roatanga, (Tel); Sagdi, sagade, akota, chakota, (Kan.); Chendala, (Coorg); Puva, (Mal.); Gyo, kyetmouk, kobin, (Burm.) Kon, kong, conghas, (Sing.)

Kusum is the Hindustani name for the Safflower plant, and perhaps refers to the colouring matter of the lac-insect which often feeds upon the tree. The seeds are called paka or pacca in Calcutta.

Habitat.—"Dry, chiefly deciduous forests in the greater part India, Burma, and Ceylon, but apparently absent from Bengal and Assam. It is found from the Sutlej to Nepal in the lower Himalaya, Sub-Himalayan tract and Siwalicks up to 3,000 feet, throughout Central India, the East and West coast regions, the Deccan and Carnatic, in all deciduous forests throughout Burma

and in the low country of Ceylon up to 2,000 feet." (*Gamble, Manual of Indian Timbers*, 2nd ed. 195.)

A large deciduous tree, leafing and flowering early in the spring. "Bark $\frac{1}{2}$ in. thick, grey, ex-foliating in small rounded plates of irregular shape and size. Wood very hard. Sap-wood whitish; heart-wood light and reddish brown. Pores scanty, moderate-sized, often oval and sub-divided, often joined by pale, interrupted, wavy and concentric lines. Medullary rays very fine, very numerous, wavy, uniform and equidistant, closely packed; the distance between the rays less than the transverse diameter of the Pores" (*Gamble*). Leaves paripinnate 8-16 in. Leaflets opposite, sessile, 1-10 by $\frac{2}{3}$ - $4\frac{1}{4}$ in., the lowest pairs the smallest, 1-3 in. long; terminal pair 6-9 in. long; deep-crimson when young, soon changing to green. Flowers yellow (green, says *Trimen*); male and bi-sexual, generally on different trees, fascicled on interrupted, often slender, racemes. *Hiern* says flowers are yellowish or green. Calyx small, 4-cleft. Petals 0. Stamens 8-6, longer than Calyx; filaments more or less hairy; disk flat, undulate. Ovary 3-4-celled, hairy; style rigid; stigma sometimes capitate, 3-4-cleft, one, erect, ovate in each cell. Fruit 1 in. long, usually echinate. Seeds 1-2; testa brown, enclosed in a succulent arillus of pleasantly acid taste. Cotyledons full of oil. This is the Ceylon Oak of the English (*Trimen*).

There is a female tree, found by Assistant-Surgeon *Johnstone*, Sub I. M. S., incharge of the *Andheri Nasurwanji Wadia Charitable Dispensary* in the garden of *Mr. Guzdar* at *Andheri* (Thana District)--*K. R. K.*, 1915.

Use:—The bark is astringent; rubbed up with oil, the natives use it to cure itch (*Roxb.*).

The oil of the seeds proves a very efficient and stimulating agent for the scalp, both cleansing it and promoting the growth of hair (*Ph. J.*, Dec. 3, 1887.)

The oil is used by native practitioners for the cure of itch and acne.

The *Santals* use the bark by external application to relieve pains in the back and the loins (*Revd. A. Campbell*).

In the Nilgiris the oil is used for anointing the body. The medicinal effects are variously reported as purgative (in the United Provinces) and as prophylactic against cholera (in Thana division, Bombay). It is more usual to apply it externally in massage for rheumatism (Bombay), for the cure of headache (Sambalpur, Central Provinces). Its application in Bombay, Malabar, and Coorg is said to be effective in removing itch and other forms of skin diseases, and this remedy is known to the wild forest tribes. The powdered seeds are applied to ulcers of animals and for removing maggots.

The seeds.

The seeds are ovoid or rounded in shape, about five-eighths of an inch long by half an inch broad, smooth, reddish-brown in colour, and marked with an indented hilum at one end. One hundred seeds weigh 57 grains giving an average weight of 87 grains per seed. On removing the brown, brittle shell a dirty white kernel is disclosed with white markings on the testa. One hundred parts of seeds afford 66 parts of kernels and 34 parts of shells. The kernels extracted with ether or petroleum spirit yielded in the Calcutta Indian Museum laboratory 61.4 per cent. of oil, showing that the entire seed contains 40.5 per cent. of oil.

Mr. J. H. Walker of the Oil Department of the Gouripore Company, Naihati, obtained a yield of 60.4 per cent. of a thick fixed oil from the kernels, which is equivalent to 36.7 per cent. on the nuts.

Composition of seeds and oil.

The first analysis of the seeds appears to have been made by Dr. L. Van Itallie [Apoth. Zeitung. (1889), 4:506], who separated about 36 per cent. of a buttery fat, which he called the Macassar oil of commerce. It had a specific gravity of 0.924 at 15° C., melted at 28° C., had an iodine number of 53, a saponification equivalent of 219 (1 gram required 230 mgm. of potash for saponification), contained 91 per cent. of insoluble fatty acids and 6.3 per cent. of glycerol. The fatty acids present included acetic, butyric, lauric, arachic and oleic acids.

The next recorded analysis of Macassar oil is that of Dr. K. Trummel [Apoth. Zeitung. (1889), 4:518]. The oil had a melting point of 21°-22° C. The presence of hydrocyanic acid was detected and 0.47 per cent. obtained by steam distillation. Benzaldehyde was detected in the distillate by its transformation into benzoic acid by the action of potassium permanganate.

Dr. Trummel in conjunction with Mr. Kwassick further investigated the oil in 1891 (Pharm. Zeit. May 1891, 314), after confirming previous results the authors separated the constituents of the oil. The fatty acids, with the exception of 3.15 per cent. of free oleic acid, were present as glycerides. Of these in combination 70 per cent. consisted of oleic acid, and of the solid fatty acids 5 per cent. was palmitic and 25 per cent. arachic acid, the characteristic acid of the ground-nut. Lauric acid was not present, and of the volatile fat acids only acetic and no butyric acid could be detected. Hydrocyanic was found in the oil and in the seeds, being determined as 0.03 per cent. in the former and 0.62 per cent. in

the latter. No amygdalin could be detected in the seeds, but hydrocyanic, benzaldehyde and grape sugar, possibly the decomposition products of it, were found. A small quantity of cane sugar was also separated in the crystallised form.

In 1893 an examination was made by Mr. R. Glenk (Amer. Journ. Pharm. LXV. 528) of a specimen of the oil from seeds sent from Mirzapur. The oil was described as a yellowish-white semi-solid substance having a faint odour of bitter almonds and a specific gravity of 0.942. The oil had an acid re-action, and completely liquified at 28° C. It was readily saponified by sodium hydrate even at a low temperature, forming a white hard soap. Concentrated sulphuric acid acquired a reddish-brown colour on addition of the oil. It is soluble in chloroform, ether, bisulphate of carbon, benzene, and the fixed and volatile oils.

Dr. J. J. A. Wijs examined the seeds in 1900 (Zeits. phys. Chem. 31:255-257). The seeds of *Schleichera trijuga* were obtained from the Celebes, and 60 per cent. consisted of kernels. The kernels had the following composition:—

Water	...	...	...	...	...	3.5
Fat	...	...	...	...	...	70.5
Proteids	...	...	...	...	...	12.0
Fibre and ash...	...	...	...	...	...	14.0
						<hr/> 100.0 <hr/>

The fat extracted by means of petroleum ether had the colour and consistence of butter. The following constants were determined: melting point (by the Le Sueur and Crossley method), 22° C.; melting point of the fatty acids, 52-54° C.; Hehner value, 91.55; saponification value (Henriques' cold process), 215.3; iodine value (Wijs' iodine chloride and acetic acid method), 55.0, that of the fatty acids being 58.9; Reichert-Meissl value, 9; acid number, 19.2; acid number of the fatty acids, 191.2-192.0; unsaponifiable matter, 3.12 per cent. The volatile acids (acetic acid with a little butyric acid) were examined by the Duclaux method; and the ratio of the solid (45 per cent.) to the liquid fatty acids (55 per cent. with iodine value 193.2) was determined by the Rose method. (Agricultural Ledger 1905—No. 1).

314. *Sapindus trifoliatus*, Linn. H. F. B. I.,
I. 682.

Syn.:—*S. laurifolia*, Vahl. Roxb. 331. *S. Emarginata*,
Vahl. Roxb. 331.

San:—Arishta and Phenila.

Vern.:—The fruit—Ritha (Hind.); Bara-ritha, ritha (Beng.);
ud-rack, rithâ, ringin, rithâ, rithâ (Mar.); Arithan, aritha (Guz.);

ritha (Dec.) ; Ponnauga, ponâu-kottai, pureandi, puvanti (Tam.) ; Kunkudu chettu, kukudû, koukudu, kukudu-koyalu, kukudu-Kayalu, Neykkoddaû, Pannalaw (Tel.) ; Autala, artala, thalog morathu, kukate-kayi, kugate, auta wala, puvella, punerai gaspenela, Penela (Sing.).

Eng. :—The Soap-nut Tree.

Habitat :—Common about the villages in South India and cultivated in Bengal, Ceylon, Bombay. Baroda city, in the Lakshmi Vilas Palace gardens.

A large tree. Bark shining, grey, with rough, deciduous scales. Wood yellow, hard. Leaves 5-12 in. (usually) ; normally abruptly pinnate. Leaflets 2-3 pair, elliptic, generally obtuse and somewhat emarginate, at times acute, those of the terminal pair longest, 3-7 in., glabrous or especially beneath, pubescent, with short curved or stellate hairs ; base obtuse, petioles short. Inflorescence rusty-pubescent, in terminal panicles. Calyx rusty pubescent. Flowers $\frac{1}{2}$ - $\frac{1}{3}$ in. long, white, hairy, greenish-white (Trimen). Sepals 5 elliptic, obtuse. Petals 4-5, narrower, oblong or lanceolate without scales, or with two tufts of white hair (Brandis ; "scale of the petals membranous, pilose, ciliate," says Hiern. Disk concave, edge fleshy, hirsute. Stamens 8, anthers oblong, spiculate. Ovary hairy densely rusty, tomentose. Fruit 2-3-lobed fleshy. Drupes slightly united, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, at length glaucescent, saponaceous. There are two forms of this tree usually regarded as distinct species, corresponding to Vahl's names, one with acuminate, glabrous leaves, the other with emarginate leaves, pubescent beneath.

Part used :—The fruit.

Uses :—The fruit is described in the Makhzan-ul-Adwiya, as hot, dry, tonic and alexipharmic. Four grains in wine or sherbet cure colic ; one miskal rubbed in water until it soaps, and then strained, may be given to people who have been bitten by venomous reptiles, and to those suffering from diarrhoea or cholera. Three or four grains may be given by the nose in all kinds of fits producing insensibility. Fumigations with it are useful in hysteria and melancholia. Externally,

it may be applied, by being made into a plaster with vinegar, to the bites of reptiles, and to scrofulous swellings. The root is said to be useful as an expectorant. Pessaries made of the kernel of the seed are used to stimulate the uterus in child-birth and amenorrhœa. One miskal of the pulp, with one-eighth of a miskal of scammony, act as a good brisk purgative (DYMCK).

According to Ainslie, the Vytians use it as an expectorant in asthma. Externally, it is applied on pimples and abscesses (T. N. MOOKERJI).

Honniberger recommended a tincture of the capsules in chlorosis. If brayed in water and inserted under the lids, it causes a copious flow of tears, and was used in ordinary ophthalmia with considerable benefit by the late Mr. Narayan Daji (S. Arjun). In Bombay, it is given successfully as an anthelmintic, in four grain doses (DYMCK).

Physiological Action:—Internally: emetic, nauseant and expectorant. Through the nose: a remedy in hemicrania, asthma, hysteria and epilepsy. Externally: detergent, and a remedy for the stings and bites of poisonous insects, as scorpions, centipedes, &c.

Therapeutic Uses:—As an emetic: nauseant and expectorant. The pericarp or pulp of soap-nut is quite equal to ipecacuanha, if not superior to it, and is very useful in all the affections in which the latter is indicated. The emetic action of soap-nut always relieves asthma to a more or less extent, and generally more speedily than ipecacuanha and *Tylophora asthmatica*. It is also useful in the same way in some classes of colic, particularly when the latter is depending on indigestion. A thick watery solution of the drug is often resorted to by the natives of this country for the relief of hemicrania, hysteria, and epilepsy. They drop a few drops of the solution in each nostril during the fit of any of the above diseases, and it produces a temporary relief by irritating the mucous membrane and increasing its secretion, which flows out by the nostrils or in the mouth or by both. I gave a trial to this plan of treatment, in my own practice, not only in the above maladies, but also

in asthma, and the result was pretty favourable. There was more or less relief in almost every case of hemicrania and asthma in which the solution was tried; but the cases of hysteria and epilepsy benefited by it were very few. Although the relief afforded by the solution is always temporary, yet it is in many cases instantaneous. The quantity of the solution must not be more than four or five drops in each nostril, for in one case in which it exceeded ten or twelve drops, the irritation of the membrane was severe and lasted for one or two days. Applied in the form of paste or poultice over the parts stung or bitten by poisonous insects, as scorpions, centipedes, &c., the pulp of soap-nut relieved the pain in two or three cases to my own knowledge. When bruised and agitated in water, it forms suds like soap, and in this condition is an efficient detergent and very useful for washing and cleaning the body, linen and hair. The kernel of the seeds is sweetish, nutrient, and yields an oil on expression, which is a very good substitute for almond oil.

I have been using the pericarp of soap-nut in my practice for several months, and have just (August 1887) discovered it to be the one of the best, cheapest and commonest emetics in India. While it is as safe as ipecacuanha and several other vegetable emetics, it is decidedly more speedy in its action than all those drugs. It is however, required to be employed in a much larger dose than ipecacuanha; but this is no disadvantage, for it is always administered in the form of a draught, and this draught is less nauseous and unpleasant than that of ipecacuanha and many other emetics. As an emetic, the soap-nut well deserves to be brought into general use by the medical profession.

Soap-nut is supposed to be a good anthelmintic in some native medical works, in four or five grain doses; but this is not really the case. I have used it in very large doses (ʒj to ʒij) in many cases, and its emetic action was sometimes accompanied by one or two loose motions. But I have neither seen nor heard of any of my patients passing a single round or any other abdominal worm on any occasion. The root of the

soap-nut tree is woody, very hard and quite inert. The root-bark and bark, however, contain the vegetable principle, *saponin*, and form froth-like soap, when bruised and agitated in water. I have used each of these drugs in decoction, and in large and repeated doses, and found them to be very mild expectorants and demulcents. As medicines, they are so weak, that I did not consider them worthy of being treated as such. (MOODEEN SHERIFF).

315. *S. Mukorossi*, Gaertn. H.F.B.I., I. 683.

There are two forms of this plant :—(1) *S. detergens* Roxb. 332 ; (2) *S. Acuminata* Wall. Royle, Ill. 139.

Sans. :—Phenila, Arista.

Vern. :—Rithá, dodan, kammar (H.) ; Dodan (Pb.) ; Itá (Uriya).

Habitat :—Cultivated throughout N. W. India, Bengal, Kumaon, Sylhet and Assam.

A handsome tree, attaining 60ft., deciduous. Bark grey, wood light yellow, rough, moderately hard, compact and close-grained. Leaves alternate, paripinnate, 12-20in. long. Leaflets 5-10 pair ; opposite or alternate, $3\frac{1}{2}$ -6 by 1-3in., gradually smaller towards the apex of the rachis, lanceolate, acuminate, entire, coriaceous, glabrous ; lateral nerves numerous, petiolate $\frac{1}{10}$ - $\frac{1}{2}$ in. long. Inflorescence a terminal thyrus or compound cymose panicle. Flowers small, regular, polygamous. Calyx-lobes somewhat unequal, ciliate. Petals white, inserted in the centre of the disk ; filaments 8, white, woolly ; anthers versatile. Ovary usually 3-celled. Fruit a fleshy globose, 1-seeded drupe ; $\frac{1}{2}$ -1in. diam. Seed smooth black, loose inside when dry. The saponaceous pericarp wrinkled and translucent in the dry fruit (Kanjilal).

Parts used :—The fruits and seeds.

Uses :—The fruits are used medicinally in salivation, epilepsy and as an expectorant. They are also recommended for the cure of chlorosis (Watt).

Honnigberger states that seeds pounded with water, are said often to put an end to an epileptic paroxysm, a small quantity being introduced into the patient's mouth.

From the soft parts of the dried berries, 10.5 p. c. of the saponin, $C_{17}H_{26}O_{10}$ is obtained. J. Ch. S. 1901 A. I. 648.

The saponin occurs in the form of salts, probably Na and K. The powdered fruit shells are extd. with 95% alc., Pb (OAc)₂ is added to ppt. the Pb salt of the saponin, and the Pb salt is decompd. by H₂S, the soln. evapd., dild. with water and acidified with dil. HCl; the saponin seps. very slowly as an almost white flocculent ppt. It is filtered, washed with dil. alc. and purified first by dialysis, then by pptn. from alc. with H₂O. When dried it forms a white powder, sol. in alc., MeOH. insol. in H₂O, Et₂O, CHCl₃, acetone and petr. ether. H₂SO₄ gives a yellowish red color changing to reddish violet; when the saponin is added drop by drop, to a soln. in Ac₂O, a violet-red color results. NaOH added to a suspension in H₂O, forms a foaming, strongly hemolytic soln., $[\alpha]_D^{20} +13.28^\circ$ (in alc.). Fehling soln. is not reduced directly. On hydrolysis with 3% H₂SO₄ or alc. HCl, sapogenin and d-arabinose are formed. Sapogenin, white, odorless and tasteless plates from alc. m. 319°, insol. in H₂O, Et₂O, CHCl₃, acetone and petr. ether, sol. in alc., MeOH and alc. KOH. Potassium salt, C₃₁H₄₇O₅K, white needles, difficultly sol. in H₂O. Barium salt, white needles. Triacetylsapogenin, prepd. by heating a mixt. of sapogenin, AcCl and AcONa at the b. p., fine white needles, m. 167°. Benzoylsapogenin, m. 107°. Monomethylsapogenin, prepd. with Me₂SO₄, needles (from alc.), m. 218°.—*Chemical Abstracts*, for July 20, 1916 p. 1864.

316. *Nephelium litchi*, Camb. H.F.B.I., I. 687.
Roxb. 328.

Habitat:—Cultivated in India; originally an ative of China.

Vern:—Litchi (H.); Kyetmauk (Burm.); Lichi (Bomb.).

A handsome, evergreen tree, 30-40ft. high; clear stem 12-20ft. long, girth 3-4ft. Bark thin, grey, rough. Wood red, hard, heavy. Pores moderate-sized, the transverse diameter usually considerably greater than the distance between the rays. Medullary rays very fine, very numerous (Gamble), all parts glabrous. Leaves usually abruptly pinnate; leaflets in 6 to 8 pair, opposite, lanceolate, shortly petioled, about 3-6in. long, acuminate, entire, coriaceous, glossy above, glaucous beneath, the netvenation obsolete; flowers minute, greenish, shortly pedicelled, forming a terminal branched, usually slightly puberulous panicle, of the length of the leaves or longer; petals none. Stamens 6-8; filaments and ovary pubescent. Style with 2-stigmate lobes; fruit-lobes usually solitary by abortion, rarely haired, oval, the size of a pigeon's egg, covered by the red muricate-areolate, somewhat crustaceous epicarp, 1-seeded; the seed large, black, shining, completely covered with the

sappy, whitish or pale bluish edible, delicious, sweet arillus, with a fine rosy smell; juice refreshing.

Uses:—In China the leaves are stated to be officinal as a remedy for the bites of animals (Duthie in Watt's Dictionary).

317. *N. Longana*, *Camb.* H.F.B.I., I. 688, *Roxb.* 329.

Vern.:—Ashphal (B.); Wumb, wumb-ashphal (Bomb.); Vomb (Mar.); Púvati, Nuraí. (Tam.); Malahcota, Kanakindali (Kan.); Kayetmauk (Lower Burma); Tawthayet (Upper Burma); Mora, Rasamora (Sinhalese).

Habitat:—Westside of the Peninsula, from the Konkan southwards. Khasi Hills. Burma.

Cultivated in N. India, Ceylon, Malaya Peninsula, Himalaya, from the Jhelum to Bhutan. Dehra Dun.

A large evergreen tree, attaining 50ft. Bark smooth, yellowish grey. Wood red, moderately hard. Leaves paripinnate, 4-18in. Leaflets 4-10 (2-5 pair) opposite, alternate usually rather obtuse at both ends, glabrous above, sub-glaucouscent, glabrous or nearly so, marked with lateral veins beneath, wavy, entire, base oblique. Panicles ample, rusty pubescent. Flowers monœcious $\frac{1}{2}$ in. across. Calyx tomentose, segments 5-6, narrowly imbricate. Petals pubescent, spathulate, as long as Calyx. Stamens 6-10; in the male flower long-exserted, in the hermaphrodite flower, as long as Calyx; filaments hairy near base. Anthers glabrous, ovary 2-3-lobed, hairy. Carpel usually one, ovoid or globose, nearly smooth, yellowish-red, $\frac{3}{4}$ in. diam. Seed entirely enclosed by the succulent sweet edible arillus.

Use:—In China the fruit is reputed to be nutrient, stomachic and anthelmintic (Duthie l. c.)

The seed of the following plant belonging to this genus has been chemically analysed.

Nephelium Lappaceum, *Linn.* H.F.B.I., I. 687.

The percentage composition of the ground seed is as follows. Water, 5.87; fat, soluble in ether and petroleum 35.07; ether extractive matter, insoluble in petroleum, 3.00; ash, 1.95; albumin, 8.89. Crude fibre, 6.90; starch, 25.63; sugar, 1.25. The fats consist of the triglycerides of arachic and oleic acids, together with a very small quantity of the triglyceride of stearic acid.—J. Ch. S. LXX, pt. II, (1896), p. 209.

318. *Acer pictum*, Thunb. H.F.B.I., I. 696.

The commonest Maple of the West Himalayan range.

Current name: *Acer cultratum*. Wall.

Vern.:—Kilpattar, trekhan, tarkhana, Kakru, Kanjar, Kunzal, jerimu, laur, tian (Pb.); Kanchali, Kainjli (N. W. P.), Kainchli, Kabûsi, Dûdh Kainju (Jaunsar); Dhadonjra (Simla); Tikta, pata, bankima (Kumaon); Gudkima, potli, dumitha (Garhwal); Chindia, tilani, Chitulia, (Dotial).

Habitat:—Outer and Middle Himalaya, from the Indus to Assam at 4-9,000ft. Tibetan drinking-cups are made out of the knotty excrescences.

A handsome, moderate-sized tree. Bark thin grey. Wood white, soft to moderately hard, close-grained. Pores very small, scanty. Medullary rays fine and very fine, dark, with a pretty, fine silver-grain (Gamble). Leaves 2 to 5 by $2\frac{1}{2}$ to 7in., broader than long, 5-7-lobed, rather membranous, glabrous, turning red before falling; margins quite entire; base usually deeply cordate, rarely truncate. Petiole 1-6in. long, slender, flexuous. Flowers glabrous, on slender pedicels, arranged in terminal or lateral corymbs. Sepals about $\frac{1}{10}$ in. long, oblong. Petals as long as the sepals, spathulate. Stamens shorter than the petals. Fruit glabrous; nuts thin; wings 1-1 $\frac{1}{2}$ in. long, very divergent, with the back sigmoidly curved. Flowers, April to May. Fruit, June and July.

Uses:—The knots on the stems are made into the curious water-cups supposed by some of the hill tribes to have a medicinal influence over the water.

The leaves are said to yield an acrid juice in Kanáwar which blisters the hands.

319. *Dodonæa viscosa*, Linn.; H.F.B.I., I. 697.

Syn.:—*D. angustifolia*, Willd and *D. diodea*, Roxb. 324.

Vern.:—Bandari, zakhmi (Bomb.); Alíar (H.); Sanatha (Hazara); Dhásera, dawa ka jhár, latchmi, Sanatha, mendru ban-mandú, Sántha, mendar (Pb.); Ghuráské, vera-vena (Pushtu); Pipalu (Simla); Virali (Tam.); Bandaru, golla pulleda bandédu (Tel.); Bandurgi, bandrike (Kan.); Eta and Werella (Sinhalese).

Habitat:—Throughout India, from the Indus eastwards, and southwards to Ceylon and Malacca.

A gregarious evergreen shrub or small tree. Bark thin, grey, exfoliating, in long thin strips. Heart-wood extremely hard and close-grained, dark brown, with an irregular outline, sometimes mottled with black; sap-wood pale. Pores very small, scattered or in short radial lines. Medullary rays fine, very numerous, the distance between them equal to the diameter of the pores (Gamble). Shoots terete or somewhat angular. Leaves more or less viscid, with shining yellowish resin, very variable in breadth, 1-5 by 1-1½ in., undivided, oblanceolate, glabrous, subapiculate, base cuneate-alternate, subsessile, margin, revolute, entire or nearly so. Cymes terminal, short. Flowers regular, yellowish, polygamous, inconspicuous. Sepals oblong, 5-2 imbricate or valvate, $\frac{1}{10}$ - $\frac{1}{8}$ in. long. Petals absent. Stamens usually 8, as long as sepals in male flowers, shorter than the sepals in hermaphrodite flowers; filaments much shorter than the anthers. Disk inconspicuous. Ovary 3 or 4-celled, 2 ovules in each cell. Style cylindric, 2-lobed on top. Fruit a membranous capsule, with 2-4 broad wings from base to style, $\frac{1}{2}$ in. long and $\frac{3}{4}$ in. across, including the wings, separating septically into as many valves as cells, each valve winged on its back. Seeds opaque, dark brown or black, with a thickened funicle.

Parts used:—The leaves.

Uses:—The leaves of this shrub are viscid, and have a somewhat sour and bitter taste (Dymock.)

Lindley says the leaves are used in baths and fomentations.

It is believed that the powdered leaves applied over a wound will heal it without leaving a white scar. It is applied in burns and scalds. Said to be useful also in rheumatism (C. J. Peters in Watt's Dictionary.) Said to possess febrifuge properties.

In the Punjab, it is used in snake-bite. For this purpose, the leaves are bruised and applied to the bitten part; juice of the leaves is also given internally (B. D. B.).

N. O. ANACARDIACEÆ.

320. *Rhus parviflora*, Roxb. H.F.B.I., II. 9, Roxb, 274.

Habitat :—Western Himalaya, from Kumaon to Nepal. Central India on the Pachmarhi Hills.

Vern. :—Tung, rai túng, tumrá (Ph. and H.); Tungá, tungla, dúnglá, tumra, rannel (N. W. P.); Samák (Kashmir).

A large shrub or small tree, unarmed, often gregarious. "Bark thin, rough, reddish-brown. Wood dark, reddish-brown, streaked, very hard, close-grained; sapwood light brown. Annual rings marked by a line and rather more numerous pores. Pores small, scattered, sometimes in short radial strings. Medullary rays fine, numerous, the distance between them about equal to diameter" (Gamble). Branchlets, petioles, underside of leaves and inflorescence clothed with dense tomentum. Leaves trifoliate. Leaflets obovate, the lower portion entire, the upper irregular, crenate. Terminal leaflets 2-3in. long, narrowed into a short marginate petiole, the lateral sessile, smaller. Panicle large terminal, the lower branches from the axils of leaves, bracts linear, minute, pedicels shorter than the flower. Sepals ovate, two narrower than the others; petals oblong, more than twice the length of the sepals. Disk five-lobed. Drupe glabrous, brown, shining, $\frac{1}{2}$ in. diam. (Brandis).

Part used :—The fruit.

Use :—Used in Hindu medicine, and, mixed with salt, is said to act like tamarind (Stewart.)

321. *R. semialata*, Murray, H.F.B.I., II. 10.

Syn. :—*R. bucki amela*, Roxb. 273.

Habitat :—Temperate Himalaya, from Banahal to Sikkim, and the Khasi Mountains.

Vern. :—Tatri, arkhar, arkol (Pb.); Dakhmila, dáswila (N. W. P.); Bakkiawela (Nepal); Takhril (Lepcha).

A middle-sized, deciduous tree. Young parts covered with dark grey pubescence. Resinous canal in the bark filled with white milk which is sticky, but does not turn black.

Branchlets, petioles, underside of leaves and inflorescence clothed with short, soft brownish grey pubescence (Brandis). Leaves not aromatic, imparipinnate, over a foot long, turning red before falling; common petiole usually winged. Leaflets 4-6 pair, opposite, sessile 2-4 by 1-2 in., elliptic, acuminate, deeply crenate or dentate, glabrous above, soft tomentose beneath; lateral nerves 10-15 pair, parallel; base rounded, somewhat oblique. Panicles terminal, 6-8 in. long, conical, dense-flowered. Flowers $\frac{1}{2}$ in. diam., pale green. Sepals ovate; petals oblong, ciliate, much exceeding the sepals. Wood soft, white, with dark streaks. Fruit a drupe, tomentose, eaten by the hill people (Kanjilal).

Outer Himalya Ranges, Assam, Khasi Shan and Naga Hills. Jaunsar and Tehri-Garhwal, 3-7000 ft. Dhârfagad and Tons Valleys. Simla, the glen, Mahasu.

Galls of various shapes on branches, used for ink (Collett). Flowers pale yellow green (Brandis).

Use :—The fruit is given in colic (Stewart.)

322. *R. Wallichii*, Hook f. H.F.B.I., II. 11.

Vern. :—Kambal, godúmbal, arkhar (Pb.); Akoria, Kaunui, bhaliún (N. W. P.); Bhálaio, chosi (Nepal).

Habitat :—Temperate Himalaya, from Garhwal to Nepal.

A small or moderate-sized, deciduous tree, attaining 50 ft. Bark smooth, grey; resin-canals in bark, filled with white milk which turns black and raises blisters in skin. Sapwood white, soft. Heartwood reddish brown, yellow when dry (Brandis). Branchlets, petioles, underside of leaflets and panicles densely clothed with yellowish brown tomentum. Leaves imparipinnate, approximate, near the ends of branches, not aromatic, petiole terete. Leaflets 3-5 pair, quite entire, coriaceous, elliptic or oblong acuminate, shortly petiolulate, base rounded, upper surface pubescent or glabrous; 4-7 in. long, 2-3 in. broad. Secondary nerves 18-25 pair; parallel. Panicles axillary, much shorter than the leaves; branches short, stout. Flowers sub-sessile, $\frac{1}{2}$ in. diam., greenish white. Petals longer than sepals, with dark veins, concave; sepals broadly ovate-obtuse. Filaments short, anthers large. Disk

broad, cup-shaped obscurely lobed. Drupes densely crowded, $\frac{1}{3}$ in. diam., globose, puberulous, epicarp. dry, crustaceous, bursting irregularly; stone globose, very thick, bony, surrounded by vegetable wax.

Use:—The juice of the leaves is corrosive and blisters the skin (Stewart.)

323. *R. insignis* Book f. H. F.B.I., II. 11.

Vern.:—Kagphulai (Nepal); Serh (Lepcha).

Habitat:—Sikkim, Himalaya and the Khasi Mountains.

A small, beautiful, deciduous tree; attains 50ft. Bark thin grey. Wood grey, soft; heart-wood yellowish brown. Medullary rays fine, numerous. Leaves 12-18in.; petiole terete. Leaflets 6-9 by 3-4 $\frac{1}{2}$ in., coriaceous, quite entire, elliptic or oblong, abruptly acuminate, glabrous and shining above, rusty, softly tomentose beneath; nerves very numerous, as in *R. Wallichii*; panicles larger, more lax and nearly glabrous. Fruiting panicles axillary, stout, 10in. long, peduncled; branches spreading. Drupes scattered on panicles, smaller than in *R. Wallichii*, globose, $\frac{1}{3}$ in. diam.; epicarp thin, dry, bursting irregularly and enclosing a globose white mass of vegetable wax, containing a small crustaceous stone.

Use:—The juice is a powerful vesicant (Gamble).

324. *R. succedanea*, Linn. H.F.B.I., II. 12, Roxb. 273.

Sans.:—Karkat sringi.

Vern.:—Tatree, rikul (Pb.); Kakra-Singi, kakkarsing (H.); Kakra sringi (B.); Raniwalai (Nepal); Serhnyok (Lepcha); Dingkain (Khasia).

Habitat:—Temperate Himalaya, from the Jhelum eastward. From Kashmir to Sikkim Bhutan, Khasia Mts. Tehri Garhwal, Lambatacl. Pajidhar above Nairtwar. Valleys near Simla (Collett). Found by me," says Brandis, "in the Rupen Valley, October 1874."

A middle-sized, deciduous tree with dark grey thin bark. Leaves imparipinnate, approximate near the ends of the branches. Leaflets 3-6 pair, opposite, 3-6 by 1 $\frac{1}{2}$ -3in., ovate-lan-

ceolate, long, acuminate, entire, thinly coriaceous, usually quite glabrous, lateral nerves 8-15 pair, alternating with shorter intermediate ones; base rounded acute or oblique, petiolules slender, $\frac{1}{8}$ - $\frac{2}{5}$ in. long. Panicles axillary, with slender and drooping ramifications, much shorter than the leaves. Flowers pedicelled, scarcely $\frac{1}{10}$ in. diam., greenish yellow. Sepals ovate-obtuse. Petals much larger, oblong or obtuse. Disk 5-lobed. Drupes $\frac{1}{4}$ in. diam., compressed, glabrous, rugose, yellow or light brown; epicarp thin, bursting irregularly. Mesocarp fibrous. Kernel compressed, hard, surrounded by a vegetable wax (Kanjilal), "mixed with the fibre," adds Brandis.

Use.—The juice of the leaves is said to blister the skin (Stewart). The fruit is considered officinal and is used in Kashmir in the treatment of phthisis.

Chemistry.—The sap is a thick, nearly white, alkaline cream, superficially oxidisable by air to an intensely black, impervious substance, insoluble in the usual solvents.

Complete oxidation only takes place in the presence of a diastatic ferment, *laccase*, which can be separated from the other essential constituent of the sap by means of alcohol, in which it is insoluble. When precipitated by alcohol from aqueous solution, the crude laccase dries to white, opaque fragments, like gum, and is probably a mixture of the ferment with carbohydrates, as it can be oxidised to mucic acid, and hydrolysed to galactose and arabinose.

From the portion of the sap soluble in alcohol, a substance, *laccol*, probably a polyphenol, can be precipitated by lead acetate. It is a thick oil, insoluble in water, but soluble in alcohol, &c., and is intensely irritating to the skin, as is the crude sap. Laccol is readily oxidisable in the air to a reddish, viscous, or resinous substance; in alkaline solution, it behaves like pyrogallol, blackening and absorbing oxygen with such rapidity as to become hot; it reduces ferric chloride in alcoholic solution, forming a black, metallic derivative.

When laccol is precipitated from alcoholic solution by an aqueous solution of laccase, the white emulsion rapidly blackens from absorption of oxygen; but this does not take place if the laccase solution has been boiled, or if water alone is the precipitant. The action of laccase on gallic acid &c., is similar, the rate of absorption of oxygen being enormously increased. As the ferment has no action on starch, sugar, amygdalin, &c., it seems to be the first member of a new class of "oxidising diastases."

Since laccase is present in many plants, it seems not improbable that this diastase plays an important part in the respiration of plants.

J. Ch. S. 1895 A I p. 386.

325.—*Pistacia integerrima*, Stewart, H.F.B.I.,
II. 13.

Syn.:—R. Kakrasingee, Royle, Ill. 175.

Sans.:—Karkatasringi.

Vern.:—Kâkrasingi (H. and B.); Kaka, kakar, kangar, tuga (Pb.); Kâkkatashingi (Tam.); Kakra, galls-kakra-singi (Hind.) kâkrâshingî (Mar.) (Guz.); Galls:—kakrasringi (Beng.); Kakhar, drek, gurgu (Kashmir); Kaugar, khaugar, kakar, kakkar, khakkar, kakkrei, kakra, kakkeran, kakrai, kakkran-gelie, kakla, drek, gurgu, tauhari, taugu, shne, sarawau, masna. Galls:—Kakra-singi Fruit:—Sumak (P. B.); Sarawau, shne, masna, (Pushto). Galls:—Kakka-tashingi; (Tam.); Galls:—Kakarashingi (Tel.) Galls:—Dusptapu chattwa (Kan.).

Habitat.—Sulaiman and Salt Ranges, Punjab. Outer Western Himalaya, extending as far as Kumaon, Junsar and Tehri-Garhwal.

A middle-sized, deciduous tree. Bark grey, rough. Wood very hard, close and even-grained. Sapwood white. Heartwood yellowish brown, beautifully mottled with yellow and dark veins. Young shoots red. Leaves aromatic, alternate, impari-or paripinnate, finely pubescent when young, 6-9in. long; leaflets 4-6 pair, usually opposite or subopposite (Kanjilal); minutely petioluled, 3-6 by 1-1½in., lanceolate from an oblique base, long, acuminate, entire, hard, coriaceous, glabrous; main-lateral nerves about 20 pair, slender. Inflorescence a lateral panicle. Flowers small, apetalous, dioecious. Male flowers: Panicles 2-4in. long, compact, pubescent. Calyx gamosepalous, 3-5ft. Stamens 5-7 on a black disk; anthers large red. Female flowers: Panicles 6-10in. long, lax, thyrsoid. Sepals 4, free, linear, deciduous. Ovary sessile, 1-celled. Styles 3. Cohering near the base. Drupe ½in. diam., oblique, broader than long, glabrous, rugose. Irregularly shaped galls, called Kakrâ singi, from the leaves, often 6-7in. long.

Part used:—The gall.

Uses:—By the Sanskrit writers the gall is considered as tonic, expectorant and useful in cough, phthisis, asthma, fever, want of appetite and irritability of the stomach. The usual

dose is about 20 grains, combined with demulcents and aromatics.

Mahomedan writers describe them as hot, dry, and useful in chronic pulmonary affections, especially those of children; also in dyspeptic vomiting and diarrhoea. They notice their use in fever and want of appetite, and say that they are good external applications in cases of psoriasis (Dymock).

The fruit of this tree is probably the *sumak*, sold in the Punjab bazars and used to strengthen the digestion (Brandis).

The galls powdered, fried with *ghi* and a little sugar added, may be given internally with good effect in dysentery (Surgeon-Major Thompson, C. I. E., in Watts's Dictionary.)

326.—*Mangifera indica*, Linn. H.F.B.I., II. 13, Roxb.

Sans.:—Amra; Chuta (the juicy); Madhahdûta (messenger of spring).

Vern.:—Amb, âm (H.); Am (B.); Mânga maram, maa, mangas (Tam.); Âmbâ (Dec.); Mâkaudamu, mavi (Tel.); Ambâ-nujhâda (Guz.); Mavina, mâvu, amba (Kan.); Marka (Gond.); Uli (Kol.); Ul (Santal.).

Eng.:—The Mango.

Habitat:—Throughout tropical India.

A large, evergreen tree. Bark thick, dark grey, nearly black, rough, with numerous small fissures and exfoliating scales. Wood grey, in old trees, sometimes dark brown, with black streaks, and hard; in younger trees coarse-grained, soft (Gamble). Branches widely spreading. Leaves dark green, coriaceous, oblong-lanceolate, blade 5-12 in., petiole $\frac{3}{4}$ -1 $\frac{1}{2}$ in.; secondary nerves slightly arching, numerous, alternating with shorter intermediate nerves. Panicles larger, erect, pubescent. Flowers fragrant, nearly sessile, petals twice the length of Calyx-lobes. Anther one, oval, purple, sterile stamens minute, 2-4. Drupe 2-6 in. long, yellow when ripe. There are many cultivated varieties all over India.

Parts used:—The fruit, kernel, leaves, flower, bark and gum.

Use:—The smoke of the burning leaves is supposed to have a curative effect in some affections of the throat. According to the author of the *Makhzan*, the Hindus make a confection of the unripe fruit mixed with sugar, which, in times of plague or cholera, they take internally and rub all over the body; it is also stated in the same work that the midribs of the leaves calcined are used to remove warts on the eyelids. Ainslie says that the gum-resin, mixed with lime-juice or oil, is used in scabies and cutaneous affections. The juice of the ripe fruits dried in the sun, so as to form thin cakes, *Amras* or *Amwaat* (Hind.), *Ambapuri*, *Āmbipoli* (Bom.), *Amsatta* (Beng.), is used as a relish and antiscorbutic (*Dymock*).

A resin obtained from the bark of the tree is considered anti-syphilitic (Murray).

Resinous juice mixed with the white of an egg and a little opium, is considered a good specific on the Malabar Coast for diarrhœa and dysentery (Ainslie).

The unripe fruit is said to be useful in ophthalmia and eruptions, and the seeds in asthma.

The rind of the fruit is astringent and also a stimulant tonic in debility of the stomach.

The ripe fruit is considered laxative, and therefore much prized by persons labouring under habitual constipation. The bark and kernel are known as astringent and used in hæmorrhage, diarrhœa and other discharges. The decoction of the kernel, either alone or in combination with *bel* and ginger, is generally prescribed in diarrhœa. The juice of the kernel, if snuffed, can stop nasal bleeding. The kernel is also described in the Indian Pharmacopœia as an anthelmintic and containing a large quantity of gallic acid, highly useful in bleeding piles and menorrhagia.

Mango bark and fruit have been lately introduced by Dr. Linguist as a medicine in Europe; he recommends it for its extraordinary action in cases of hæmorrhage from the uterus, lungs or intestines (*Dymock*).

A native article of diet, known as *amchúr* or *ambosi* (Bom.), is made of green mangoes which have been skinned, their stones removed and the pulp cut up into pieces and dried in the sun, is recommended by the Inspector-General of Prisons, North-Western Provinces and Oudh, as a good and cheap antiscorbutic for native troops (*Dr. Emerson*).

The flowers of the mango are used either in the form of tea or powder for catarrh of the bladder. The powder is also used in the form of fumigation against mosquitoes (Brazilian Drugs, Ph. J., Oct. 25, 1884).

Introduced into America in the form of fluid extract, either from the fruit or the rind. Astringent with a specific tonic action on mucous membranes. Its effects are great in diphtheria and other malignant throat diseases. The fluid extract applied locally is very useful in hæmorrhages. (I. M. G. February 1883, p. 56).

The kernels of the seeds contain 47·5 per cent. of water, and 5·2 per cent. of fat, which melts at 36°C.; acid value, 12·3; Saponification value, 175; iodine value, 54·5; Reichert-Meissl value, 0·2. The bulk of the fat consists of oleodistearin. By adding alcohol to the ether solution of the fat until turbidity occurs, this crystallises out in fine needles; m. pt. about 44°C.; readily soluble in ether, sparingly so in alcohol.

[J. Ch. I. May 31, 1911, p. 634].

The gum contains 16·57 per cent. of moisture and 3·357 per cent. of ash, and the dry substance is soluble in water to the extent of 39·36 per cent., the solution having $[\alpha]_D -25.33^\circ$. The gum contains an oxydase, yielding a red colour with guaiacol solution.

It contains 71·42 per cent. of sugars, including 25·33 of galactose, and 35·095 of pentoses (arabinose was also separated).

The portion insoluble in water contains moisture 10·51; and in the dry substance, galactose 32·08; pentoses 42·87; total galactoses, 86·28 per cent., having $\alpha_D +64.89^\circ$.

(P. Lemeland, *J. Pharm. Chim.* (1904) *J. Ch. S.* Vol. LXXXVI, pt. II., p. 583.

327.—*Anacardium occidentale*, Linn., H.F.B.I., II. 20, *Roxb.*, 342.

Vern. :—Kajú (H.); Hijli-bádám (B.); Kottaimundi, Rolla mávu (Tam.); Kájúcha-bi, kájú (Mah.); gidi-mamedí, munda-

mamddichettu (Tel.); Jidi-váte, kempu gern bija, geru-poppu, geru-váte, gerabija godámby (Kan.); Paranki-máva kuru, Parangi-mávu, kappal-cherunkuru, kappa-mávakuru (Mal.) The hon. Inayet (Burm.).

Eng.:—The Cashew Nut.

Habitat:—Hotter parts of India, especially near the sea. Naturalised from America.

An evergreen, 10-20ft. high. Bark considerably rough. In old trees it is deeply cracked. The juice from the stem is thickish and resinous, slightly brownish, blackening on exposure. From the bark comes a yellowish hard resin having mostly the appearance of yellow amber—the Cashew gum—soluble and used for nearly the same purpose as gum-arabic." Wood dark brown. Charcoal of the wood used by the iron-smiths of Tavoy as the best for their trade. Leaves simple, smooth, alternate, ex-stipulate, quite entire, ovate or obovate, with a slightly rounded emarginate apex, smooth on both sides, of a hard texture; narrower, but obtuse at base; 4-8in. by 3-5in. Venation well-marked, whitish and permanent on the under surface. Nerves 10 pair, often less, nearly horizontal, sometimes bifurcating faintly. The bark and leaves contain much tannin. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in., slightly grooved on ventral side; at times cylindric. Panicles corymbose, branched and spreading. Bracts leafy, numerous, lanceolate, hairy. Bracteoles at base of pedicels, broadly ovate, generally lanceolate, acuminate. Flowers small pentamerous, polygamous, $\frac{1}{4}$ in. diam; yellow, with pink, longitudinal stripes, often deep-crimson; odour of mixed cloves and cinnamon. Calyx inferior, cleft nearly to base. Sepals erect, deciduous; the base of sepals a crescent, forming an erect disk. Corolla alternate, linear-lanceolate, twice as long as the sepals. Stamens usually 9, all fertile; one of these is nearly twice as long as the rest. Stamens often vary alternately. Filaments connate at base, free upwards. Anthers 2-celled, introse. Pistil in the male flower minute, with a very short style; both well-developed in the hermaphrodite flower. Ovary in the hermaphrodite flower free, campylotropous, superior, one-celled, ovoid or obcordate. Bail-

lon describes it as compresso-obovate or obcordate, hence gibbous. This is a more accurate description, I think. Style simple, solitary, filiform, eccentric, becoming convolute, as if to bring the stigma into contact with the large anther of the long filament (Roxb). Stigma minute, often tinged crimson. Ovule solitary, long, conical; inserted at the summit of a suberect, ascending panicle. Chalaza superior; micropyle introse, inferior, near funicle. Fruit an ash-coloured nut, kidney-shaped, dry, shining, indehiscent. 1 in. long, $\frac{1}{4}$ in. broad at hilum; somewhat compressed. Mesocarp soft, corky, lacunose, oleo-resinous. The epicarp and pericarp coriaceous, not woody, as Baillon says. The most noteworthy part of the plant is the succulent, fleshy, enlarged peduncle, soft and juicy, obovoid, slightly sweet, at times very acrid and irritating to the throat and tongue; popularly sold as the Kaju fruit in the bazaar, and of which much liquor is manufactured in Goa. Seed kidney-shaped which is the real fruit, corresponding to the pericarp. Testa crisp, membranous, and easily removable, mottled reddish-brown outside, deep crimson inside, of an astringent aromatic taste, separable from the kernel or milkwhite cotyledons by a resinous fracture; albumen absent.

Parts used:—The fruit, seeds and spirit.

Uses:—The bark is said to have alterative properties. The tar, which contains about 90 p. c. of anacardic acid and 10 p. c. of cardol, has recently been recommended as an external application in leprosy, ringworm, corns and obstinate ulcers; it is powerfully rubefacient and vesicant, and requires to be used with caution. In Native practice, it is sometimes used as a counter-irritant. In Europe, a tincture of the pericarp (1 to 10 of rectified spirit) has been used in doses of 2 to 10 minims as a vermifuge. According to Basiner, the subcutaneous injection of small doses of *cardol* produces on cold-blooded animals paresis, increasing to paralysis of the extremities, stupor, paralysis of respiration and tetanic spasms. In warm-blooded animals large doses are not lethal, but stupor, paralysis of the extremities and diarrhoea occur, and, after death, congestion of

the intestinal lining is found. *Cardol* seems to be excreted chiefly with the urine, but partially also with fæces. Applied on a small piece of lint to the skin of the breast, it raised a watery blister in 14 hours (Am. Journ. Pharm., 1882, Dymock).

Between the laminæ of the shell of the kernel there is a black caustic fluid, which contains an acrid, oily principle, *cardol* and a peculiar acid, *anacardic acid*.

The spirit distilled from the expressed juice of the fruit may be used as a stimulant (Watt.)

The kernel is nutritive, demulcent and emollient; and the oil emollient. In the form of mixture, the kernel is useful for all the purposes for which the *Mistura Amygdalæ* is employed, and also as a food in very weak patients suffering from incessant and chronic vomiting, with two or three minims of acid hydrocyanic dil. in each dose. The oil is a mechanical as well as a chemical antidote for irritant poisons. It not only protects, to some extent, the lining membrane of the stomach and bowels from the irritation of the poison, and prevents both the solution and absorption of it, but also neutralizes it by forming a soap with it, if it happens to be an alkaline. It is also a good vehicle for liniments and other external applications (Mooden Sheriff).

The kernels yield a light, yellow, bland oil. Niederstadt (1902) found the saponification value to be 179.84, and the iodine value, 60.6.

The pericarp or shell yields a black, acrid and powerfully vesicating oil. Crossley and Le Sueur determined the following constants: Specific gravity, 0.9594; saponification value, 45.1; iodine value, 294.2; Reichert-Meissl value, 1.26. Though it possessed an abnormally high iodine value, practical experiments showed it to be a non-drying oil.

328.—*Buchanania latifolia*, Roxb., H.F.B.I., II. 23, Roxb. 365.

Sans.:—Piyála; Chára; Chirika.

Vern.:—Piyár, piyál, piyâla, chironji (the kernel), (H.), Chironji, peal (the fruit), chirunji (the kernel), piyâl, piâl, pear (the tree), (B.); Chirauli, chirâoli (the fruit), chironji, (Pb.); Piâl, payâla, muriâ, katbhilawa, (Garhwal); Piâr, peira, paira, paila, pairwa, perrah, (Oudh); Tarum, (Kol); Pial, (Bhumij);

Peea, (Kharwar); Tarop, (Santal); Charu, char, chara, charo, (Uriya); Achâr, châr, char-ka-jhar, chironji (the fruit), char-ka-gond (the gum), (C.P.); Sârâka, surraka, herka, char-ka-gadh (the gum), (Gond); Taro, tarope, (Kurku); Sir, (Bhil); Châr-ki-châroli (the kernel), (Duk); Piyal, chârôli, châr, biji, (Bomb.); Charwari, (Hyderabad); Char, chironji (the fruit), (Behar); Mowda or katimango, marum, kat maû, aima, kâtma-maram (the plant), kâtma-payam or katma param (the fruit), katma-parpu (the kernel), (Tam.); Chara, sara, charu madudi, chiuna mora, morli morlu-banka, morlu-chettu, châra-chettu, châruchettu, or sârachettu. châra-mâmidi, jârûmâmidi (the plant), châra-pandu (the fruit), châra-puppu, charu-puppu (the kernel), (Tel); Nuskul, murkalu, murukalu, (Kan.); Kâla maram, (Mala); Chârôli, (Guj., Cutch); Pyâl-char, (Mar.); Lonepho, lunbo, lamboben, lombo or lonpo, loneopomâa, (Burm.)

Habitat:—A tree leafless only for a very short time. Found in the Sub-Himâlayan tract from the Sutlej eastward, ascending to 2,000 feet; throughout India and Burma, common in the hotter and drier parts of the empire, and frequently associated with the sâl, the mahûa, and the dâk.

A middle-sized tree, leafless only for a short time, attaining 50ft. Bark 1 in. thick, dark grey, sometimes nearly black, rough, tessellated, with regular "boss"-like prominence. Wood greyish brown, moderately hard, with a small, dark-coloured heart-wood (Gamble). Leaves 6-10in., very coriaceous or hard, nerves prominent, 15-20 pair, stout or nearly straight, usually broadly oblong, rounded at the tip, closely reticulate, softly hairy beneath. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in., stout, pubescent. Panicles terminal and axillary, tomentose, shorter than the leaves; pyramidal branches stout, bracts small, caducous. Flowers crowded, sessile, greenish white, $\frac{1}{4}$ in. diam. Calyx 5-toothed, petals oblong. Disk fleshy. Stamens 10, spreading as long as the petals. Drupe black, $\frac{1}{2}$ in., subglobose, slightly compressed, edible. Stones hard, bony, 2-valved. Seed oily, edible, pleasant to taste when fresh, soon gets rancid on keeping.

Parts used:—The fruit, seed, gum, roots, leaves.

Uses:—By Hindu writers the fruit is said to be sweet and

laxative; used to relieve thirst, burning of the body and fever. (Dutt).

The seed is very palatable and nutritious when roasted; used in medicine and considered heating (Irvine, Med. Top., Ajmere).

It yields a gum said to be administered in diarrhœa. The oil extracted from the kernels of the fruit is used as a substitute for almond oil in Native medicinal preparations and confectionery. It is also applied to glandular swellings of the neck (Watt).

In the Jhansi District, the kernel worked up into an ointment, is used in skin diseases.

In the Central Provinces, the roots and leaves, pounded and mixed with butter-milk, are taken in cases of diarrhœa. The fruit is used by Hakims in tonic medicines and for applying to the tongue when inflamed or very hard.

It is believed to cure pimples, prickly heat and itch.

In Berar, kernels pounded and applied outwardly are used as a remedy for itch; also employed by women to remove spots and blemishes from the face. (The Agricultural Ledger, 1900, No. 9.)

In the Bombay Presidency, the kernel is employed as a tonic, being sometimes substituted for the almond.

In the Madras Presidency, the gum with goat's milk is given internally for intercostal pains.

It is used to flavour preserved preparations of milk, such as Berfi, Basundi, Pêdhê, Halvâ of the white gourd; preserved cocoanut sweets, such as Khobripâk, in Bombay, Surat, Ahmedabad, Poona.

The kernels are brown and mottled with darker brown, and laterally compressed like vetch seeds. They yield 58·6 per cent. of oil (Church), which commences to congeal into a white semisolid mass at 18·5°.

Crossley and Le Sueur obtained the following constants: Specific gravity at 100°, 0·8942; melting point, 32°; acid value, 15·4; saponification value, 193·6; iodine value, 57·3; Reichert-Meissl value, 0·33; refractive index, 1·4584; insoluble acids and unsaponifiable, 95·8 per cent.

329.—*Melanorrhœa usitata*, Wall. H.F.B.I., II. 25.

Eng. :—The Varnish Tree.

Vern. :—Khen (Manipur); Soothan (Tel.); Thitsi (Burmese).

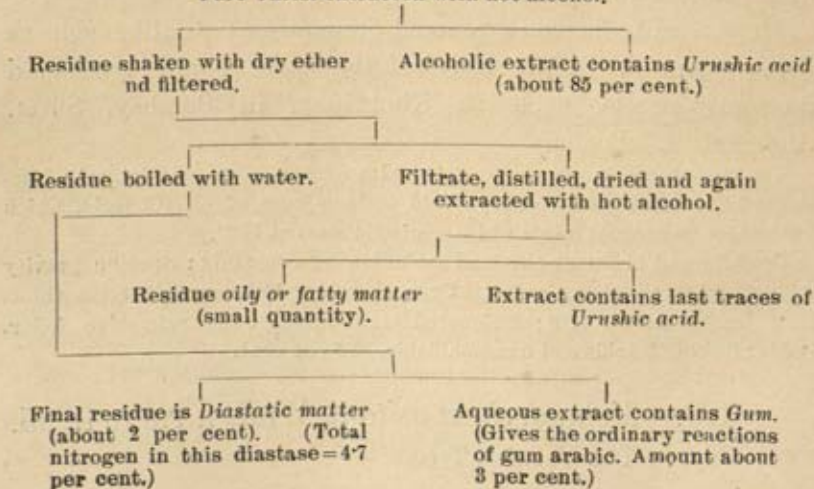
Habitat :—Manipur.

A large, deciduous tree. Bark dark grey. Wood dark red, with yellowish streaks turning very dark after long exposure; very hard. Branchlets very stout, velvety. Petioles, underside of leaves, and panicles softly tomentose. Leaves obovate or oblanceolate; 6-14 by 4-6 in., base cuneate; nerves 28-30 pair, stout, straight. Petiole flattened, winged, $\frac{1}{2}$ -1 in. Panicles 1 ft. long, peduncled. Flowers white, lax, $\frac{1}{2}$ in. diam.; pedicels slender; petals pubescent. Stamens many, 20-30. Calyx calyptriform, beaked, pubescent. Petals 5-6, eventually 2-4 in. long, linear-oblong, obtuse, coriaceous, reticulated, gland-dotted, pubescent. Drupe red, glaucous; $\frac{1}{2}$ - $\frac{1}{2}$ in. diam., stalk thick, $\frac{1}{2}$ in. long, supported by the oblong, stellately-spreading, enlarged petals, 2-4 in. long. Pedicel $\frac{1}{2}$ in. The tree yields the black Burmese lacquer or varnish from incisions made into the bark, while the tree is in leaf (Brandis).

Use :—The thick, greyish fluid, which is found in every part of the plant, has been used in medicine as an anthelmintic with great success. If the juice be too much handled, it causes erysipelas-like swellings in certain constitutions, which are cured by the application of an infusion of teakwood.

Separation of Constituents.

Pure Thitsi extracted with hot alcohol.



The present investigation has proved with the aid of the method outlined above that the most important and main constituent of the Burmese natural varnish is urushic acid, which amounts to about 85 per cent. in the pure unadulterated specimens. (Mr. Puran Singh's paper in the *Indian Forest Records*, Vol. I. part IV.)

330.—*Odina wodier*, Roxb., H.F.B.I., II. 29, Roxb. 336.

Sans :—Jingini.

Vern. :—Jingan, kashmala, kaimul, mowen H.); Jival, bohar, ghadi (B.); Odiya-maram, wodier, Odi, (Tam.); Odai-manu (Tel.); Shimti; Múi [Bomb. and Sind]; Mooi, indrámai [Uriya].

(Porebunder) Mavedo; (Guj.) Mavédi; (Maráthi) Shimti, Mewâ, Moyini; (Hind.) Jingan, Máyini;

Habitat :—Throughout the hotter parts of India. Ceylon. Burma, Andaman Isles.

A moderate-sized or large, deciduous tree. Bark $\frac{1}{2}$ in. thick, compact, grey, smooth, exfoliating in small irregular plates. The stem affords gum. Wood moderately hard, close-grained. Sapwood large white; heart-wood scanty, light red when fresh cut, turning reddish brown on exposure. Leaves imparipinnate. Rachis 6-10 in., cylindric, glabrous, swollen at base. Leaflets 3-4 pair, opposite; 2-6 pair, says Trimen, and a terminal one, shortly stalked or nearly sessile, 3-5 in., lanceolate, acute or rounded, often unequal at base, more or less caudate-acuminate, entire or faintly crenate, glabrous, shining and deeply tinged with pink when young. Pinkish yellow. Flowers small, nearly sessile, pinkish yellow, appearing when the tree is bare of leaves. Inflorescence: the flowers are in small clusters, laxly arranged on elongated, slightly branched, stellate, pubescent, axillary panicles, appearing with the young leaves on the new shoots. Calyx minute, hairy. Petals oblong-oval, obtuse, reflexed in female flowers. Ovary oblong, large, glabrous. Styles very stout, divaricate. Drupe about $\frac{1}{2}$ in., reniform, ovoid, obtuse, compressed, smooth. Stone reniform, very hard.

Parts used :—The bark, gum and leaves. The bark yields a gum.

Use:—The bark, powdered and mixed with Margosa oil, is considered by the Vytians a valuable application to old and obstinate ulcers. [Ainslie]. The gum beaten up with coconut milk, is applied to sprains and bruises, and the leaves boiled in oil are used for a similar purpose [Wight].

In the Indian Pharmacopœia the astringent properties of the bark are noticed, and its use as a lotion in impetiginous eruptions and obstinate ulcerations. The late Dr. Bholanath Bose recommended a decoction of the bark as an astringent gargle. Powdered bark used for leprous ulcers as a paste in Ratnagiri.

The juice of the green branches, in a four-ounce dose mixed with two ounces of tamarind, is given as an emetic in cases of coma or in insensibility produced by opium or other narcotics [Taylor's Topography of Dacca.]

A decoction of the bark is useful internally in some cases of atonic dyspepsia and general debility, particularly if it is combined with tincture of gentian, calumba, &c. [Moodeen Sheriff].

In Burma, a decoction of the bark is used for tooth-ache.

In some parts of the Madras Presidency and Burma, the leaves are used for all local swellings and pains of the body. They are first boiled and then applied.

331.—*Semecarpus anacardium*, Linn. f. H.F.B.I., II. 30, Roxb. 268.

Sans.:—Bhallátaka, Arushkara.

Arab.:—Habbul-fahm.

Pers.:—Biládur.

Vern.:—Bhelá, bhiláúra (H.); Bhela, bhelatuki (B.); Bhallia (Uriya); Konghi (Lepcha); Bhilavan (Dec.); Shenkottai, sherán-kottai (Tam.); Jidi-Vittulu (Tel.); Cherun kuru (Mal.); Girú (Kan.); Bibba (Bomb.); Bhiámu, (Guz.)

Eng.:—The Marking-Nut Tree.

Habitat:—Tropical outer Himalaya, from Sirmoor to Sikkim, and throughout the hotter parts of India, as far east as Assam (absent in the Eastern Peninsula).

A handsome tree, 20-40ft. high; deciduous, girth 4-6ft. Bark 1in. thick, dusky grey; wounds on bark yield a brownish soft gum which dissolves slowly in the mouth. Wood ash-coloured, reddish white or brown; even, but open-grained; full of acrid juice, causing irritation and swelling. Leaves generally closely arranged at the extremities of the branchlets of numerous spreading branches; simple, alternate, very coriaceous, flat; 9-30in. by 5-12in., cuneate, oblong or obovate-oblong, rarely linear-oblong. Apex rounded, margins entire, cartilaginous. Base rounded, cordate or cuneate; surface opaque above, slightly pubescent, especially when young, whitish or glaucous and thickly pubescent beneath. Nerves 16-25 pair, stout, slightly arched, pale whitly. Venation marked coarse on the under surface. Petiole 1-2in., densely puberulous; small, $\frac{1}{4}$ - $\frac{1}{2}$ in. diam., subsessile, fascicled in erect tomentose compound terminal panicles. Bracts and bracteoles fugacious. Estivation imbricate. Female and Hermaphrodite flowers $1\frac{1}{2}$ - $\frac{1}{4}$ in. long, longer than the almost sessile male flowers. Calyx 5-fid.; segments deciduous. Corolla greenish white or greenish yellow; petals 5, 3 or 4 times the length of Calyx, oblong, pointed at the apex, inserted under the margin of the disk, sessile, glabrous, very spreading. Disk annular, broad, between stamens and ovary. Stamens 5, alternate, inserted on the margins of the disk; imperfect or sterile in female flowers, equal, distinct; filaments subulate from a somewhat dilated base, of the length of petals. Anthers ovoid or elliptical, yellow. Ovary free, sessile, one-celled, densely appressed, tawny, hispid. Styles 3, divergent, incrassate. Stigma subclavate, shortly 2-lobed or retused. Ovules inserted at apex of the cell. Pendulous from a basal funicle. Male flowers often on a separate tree. Calyx and Corolla as in the hermaphrodite flower, but smaller. Filaments 5, of the length of petals. Anthers much larger than the hermaphrodites. Pistil absent or abortive. Fruit, a drupe, 1in. long, and about as broad or $\frac{3}{4}$ in., ovoid,

obliquely ovoid or cordate-ovate, with a slight obtuse notch on either side under the apex; unequally compressed; slightly convex in some parts, and quite plain in others; cup fleshy, orange-red, smooth, succulent, sweet, edible when ripe, formed of the thickened disk and accrescent Calyx-base. Pericarp smooth, shining, black, thick; containing between the outer and inner laminae roundish or oblong cells, full of corrosive resinous juice. This juice is white when the fruit is young, darkening on exposure to air. In the mature fruit, it is brownish or perfectly black; inner lamina hard, rugose, outer smooth, leathery, less hard. Seed pendulous, with a swollen or umbilicate funicle (Lubbock).

Testa coriaceous, inner coat somewhat fleshy. Embryo thick, milk-white. Plumule ovate-leaved, veined, conduplicate, very thin. Cotyledons fleshy, thick, white, irregularly plano-convex. Albumen absent. Radicle superior, minute, connate with the apex of the cotyledons, always directed to the hilum.

Parts used:—The fruit.

Use:—In Hindoo medicine the ripe fruits are regarded as acrid, heating, stimulant, digestive, nervine and escharotic, and are used in dyspepsia, piles, skin diseases, nervous debility, &c. (Dutt).

Mahomedan writers consider the juice of the pericarp to be hot and dry, useful in all kinds of skin diseases, palsy, epilepsy and other affections of the nervous system. Externally, it is applied to cold swellings, such as piles (Dymock).

The Hakeems administer it for weakness of memory, epilepsy, etc. They consider it to be injurious to the liver, inflames the blood, and can produce melancholia, insanity, frenzy, etc. (Honnigberger.)

The Telingee physicians use it as a specific in all kinds of venereal affections (Roxburgh). A brown gum exudes from the bark which the Hindus regard as a valuable medicine in scrofulous, venereal and leprous affections (Ainslie). An oil from the nut acts as a vesicant in rheumatism and sprains (Ainslie).

In Goa, the nut is used internally in asthma after having been steeped in butter-milk, and is also given as vermifuge. In the Concan, a single fruit is heated in the flame of a lamp and the oil allowed to drop into a quarter-seer of milk; this draught is given daily in cough, caused by relaxation of the uvula and palate. The juice of the root-bark is also used medicinally on account of its acrid properties (Dymock). The bruised nut is applied to the os uteri by the native women to procure abortion (Ph. Ind). Basiner found that within 12 hours the brown oil of the nut raised a black blister; this should be carefully protected from touch, as the fluid causes eczematous vesicles on any part of the body it may come in contact with. He has also noticed painful micturition, the urine being reddish brown and bloody, and painful stools, as a sequel to the external application of the oil (Am. J. of Pharm., 1882, Dymock).

"I have used the black, thick and acrid oil of the marking-nut, prepared either by expression or with the aid of heat, or the nut itself in the form of electuary, pretty extensively in my practice, and found it so efficacious in acute rheumatism that it may be considered a specific in that disease. The drug is also of great service in asthma, and more or less beneficial in secondary syphilis, hæmorrhoids, neuralgia, epilepsy, anæsthesia, paralysis, lepra, psoriasis and a few other cutaneous affections. Externally, the oil is a very cheap and pretty useful counter-irritant, but requires great care and caution in its employment. It should not be applied much or continuously to any part, but always in the form of parallel lines by means of a long needle or wire. In very severe cases, these lines may be crossed with other parallel lines in an opposite direction. In either case, when the blister is risen, it should be pricked and the serum allowed to dribble away; and then the use of poultices for two or three days renders the part very clean and fit to be dressed with simple dressing, carron oil or plantain leaves. The nut is more useful in hæmorrhoids in the form of fumigation than the internal administration of its oil or electuary; but unfortunately its smoke is attended with bad effects in some constitutions. Out of the two severe and painful

cases of piles I treated with fumigation, one suffered from a swelling on the face, chest and abdomen with an erysipelatous blush; while the other was quite free from all these symptoms. Both, however, were much benefited by the remedy in one sitting. Although I have not seen any case of bad effects from internal use of the marking-nut, yet there is no doubt that it is an irritant poison in a large quantity or overdose" (Moodeen Sheriff).

"Marking-nut is one of the few drugs which I have found more or less useful in all the diseases for which it is recommended in Native and other medical works. These works, however, speak of the usefulness of the drug in rheumatism in a very casual manner and only as a local application; but, according to my own experience, it is, as an internal remedy, so useful in the *acute* form of that disease that it deserves a special attention. Used in full and repeated medicinal doses, the relief it affords is very great and satisfactory, and I do not hesitate in calling it a sovereign remedy in *acute rheumatism*. It is certainly more sure and speedy in its action than salicylic acid, salicylate of soda, colchicum, &c., and therefore the best drug for the above complaint. The more recent and acute the disease is, the more speedy and successful this medicine proves. Many of the patients suffering from acute rheumatism who were brought to me in doolies or other vehicles, and who were quite unable to sit or move without assistance, were able from the use of the electuary or the acrid oil of this drug to return to me walking on the 6th or 7th day after their first visit. On a few occasions, again, I was pleasantly surprised to see them walking lamely and coming to me on the very next or 3rd morning to say they were much better. In the latter case the patients were all youths or very young men.

"With regard to the preparations of the marking-nut I have described (electuary and acrid oil), there is no difference between the therapeutic uses of them, particularly in the treatment of acute rheumatism; but the patients generally prefer the former on account of its very pleasant taste. The number of the doses of these preparations I have generally used in the 24 hours is 4, and the dose of both is the same, *viz.*, from

one and a half drachm to two drachms and a half. In some very severe cases, when the patients were very strong and robust, the dose was increased to three drachms ; but the average dose is two drachms, which is the one I have most frequently employed in my practice. As soon as the patients are much relieved and able to walk about to some extent without assistance, I generally omit the drug and complete the cure with milder or less active medicines, such as salicylate of soda, colchicum, alkalines, and with stimulant embrocations.

"In chronic and muscular forms of rheumatism, however, the marking-nut is not half as useful as it is in its acute variety, and I am therefore unable to speak much in its favour in the treatment of the former diseases.

"Marking-nut is also a good therapeutic agent in asthma, but the relief it affords in so small doses as those mentioned in some books, is very slight. To secure its best effects in this disease it should be used repeatedly and in doses similar to those I generally employ in acute rheumatism. Gout is so rare among the Natives of this country that I never had an opportunity of using this drug in any well-marked case of that disease during the last two years ; but from its great influence over acute rheumatism ; I am almost sure that it will also produce good results in the acute form of the former.

"There is a notion among the Natives of Southern India that the internal use of the marking-nut is apt to produce sore mouth or ptyalism, but I have never met with a single instance of of these bad effects, though I have administered the drug in many cases and in so large and repeated doses as those explained above.

"During the employment of the marking-nut, either externally or internally, the least appearance of a rash or redness of the skin, or an itchy or uneasy sensation in any part of the body, should be considered as a sign of the bad effects of the drug, and it should, therefore, be stopped immediately. Spiritus ammoniæ aromaticus is to be freely administered, with some demulcent drinks, such as infusum lini ; and some oil, olive or cocoanut, should be constantly smeared over the affected part

or parts. This is generally sufficient to check the above symptoms; but if they get worse and become more developed, they must be treated with some other and stronger remedies according to their nature" (Moodeen Shariff).

In the Indian Medical Gazette for March 1902, Dr. Hem Chandra Sen, Teacher of Materia Medica, Campbell Medical School, Calcutta, published an interesting paper on the Therapeutics of *Semicarpus anacardium*. According to him :—

"The oil has very powerful antiseptic properties, but is too strong an irritant to be used medicinally for any such purpose.

"The oil mitigated with butter or ghee (a dram of the oil to four ounces of ghee) is used in scaly skin eruptions, *e. g.*, psoriasis, etc. The affected part becomes softened with marked rapidity and a normal condition returns. The strength may be varied according to indications.

"This application also does good in leucoderma. Sometimes the fruits are fried in mustard oil, and the oil is used for this purpose. The leucodermic spots show foci of fresh deposition of pigments; and, after a prolonged use, distinct change of color is generally noticed.

"The oil is irritant to the whole of the digestive tract, in big doses. In medicinal doses, it increases appetite and powerfully increases the secretions.

"Partly by its own direct stimulating action, and partly by its powerful cholagogue action, it often acts as a purgative also.

"The kernel of this and of *S. Occidentale* has no irritant properties at all. It tastes like almonds, and is a good nutritive food. In fact, it is used in the preparation of sweetmeats in some districts of India.

"As a general alterative, it is often used to increase appetite, * * The power of digesting fats is said to be enormously increased. It is also a powerful carminative.

"In chronic enlargement of spleen, it can be used with advantage when there is no hepatic complication of any marked degree and fever.

"*S. anacardium* is a good cardiac tonic. Under its influence many neurotic cardiac troubles are noticed to subside in a short time. The rate of the heart beat is usually increased.

"The drug is a general respiratory stimulant. It has been tried by me with success in several cases of pneumonia in the Campbell Hospital, as well as in private practice. The condition generally improves within three or four days—an ounce of the decoction (strength two drams of the bruised fruits to the ounce),—once or sometimes twice a day having been used.

"If a fruit is heated in the flame of a lamp and a drop of the oil allowed to drop in a pint and a half of milk, the milk can be used successfully in relaxation of the uvula and cough, especially in children. * * The potency of the drug in asthma is very remarkable. The drug not only relieves the spasmodic attacks, but also tends to cure the disease by prolonged use. A course of treatment with the drug for a month or so, in winter, is highly beneficial for asthmatics.

"*S. anacardium* has a very pronounced action in subduing all forms of neuritis. In peripheral neuritis, including beriberi, I have used the decoction with milk and ghee in gradually increasing doses, with very satisfactory results.

"In Sciatica, the drug often acts like a charm. The patients feel relieved usually within 48 hours. A chronic case of Sciatica * * recovered completely in a month, with the administration of the decoction in increasing doses.

"The use of the drug in paralysis is especially noteworthy. I have found the drug efficacious in both the spasmodic and flaccid varieties of the disease. Several cases of paraplegia, spastic and simple, and many others of hemiplegia with secondary rigidity, have been successfully treated with the decoction.

* * "It is also one of the most powerful emmenagogues,

and produces good effects in dysmenorrhoea. In inflammations around the uterus (pelvic cellulitis and peritonitis) it has been used with much benefit.

"S. anacardium is a powerful diaphoretic. It is very useful in scaly skin diseases.

"It is believed by the Indians that if the drug be taken internally in small, but gradually increasing, doses in the winter, it makes one free from coughs and colds and senile degenerations.

"Winter is the best season for the use of S. anacardium. It being a very heating remedy, its dose cannot be pushed to any length in summer.

"I have been using this drug for more than six years, without seeing any bad effect other than erythematous rash. In the Campbell Hospital I have made many bed-ridden cases of disseminated sclerosis walk about in the hospital compound. As an alterative, it is very useful in secondary and tertiary stages of syphilis.

"I have used it successfully in two cases of epidemic dropsy of the legs recently."

332. *Holigarna Arnottiana*, Hook f. H.F.B.I., II. 36.

Vern.:—Bibu; hulgeri (Bom.); Holgeri (M.); Kagira, Kutugeri (Kan.)

Habitat:—Western Peninsula, from the Concan southward on the Ghats.

Leafy handsome trees with stout-branches, Leaves 6-9 by 2-3 in., coriaceous shining above reticulated or glaucous not beneath; cuneate-obovate decurrent. Nerves 10-20 pair, strong nearly straight; petiole $\frac{1}{4}$ -lin., rather slender. Panicle of compound racemes, axillary and terminal, shorter or longer

than the leaves. Flowers crowded minute; males $\frac{1}{2}$ in. diam., enveloped in tomentum. Drupe lin., oblique oblong, rounded at the top, quite glabrous, long pedicelled.

Use:—The fruit and bark are employed medicinally (Beddome; Lisboa).

333. *H. longifolia*, Roxb. H.F.B.I., II. 37, Roxb. 267.

Vern.:—Barola (B.); Sudra bibo (Mar.); Holeger (Kan.); Khreik (Magh.).

Habitat:—Chittagong.

A large, evergreen tree, with black acrid, resinous juice, young shoots rusty-tomentose, branches stout. Wood light grey, soft, light. Leaves quite glabrous, reticulated beneath, shining above, coriaceous, cuneate, obtuse or acute, 6-9 by 2-3 in.; narrowed into petiole, $\frac{1}{4}$ in. long, secondary nerves 10-20 pair. Petiolar spurs early deciduous. Panicles of compound racemes, axillary and terminal, shorter or longer than the leaves. Flowers $\frac{1}{2}$ in. long, rusty tomentose within and without, crowded; anthers red. Drupe glabrous, lin., obliquely oblong, rounded at the top.

Use:—Morton states that the fruit and bark are employed medicinally, but require to be prescribed with caution, as they are apt to give rise to dangerous symptoms. The tree exudes a black, resinous, acrid, and poisonous juice from the trunk and rind of the fruit. The secretion is of a powerfully caustic nature and blisters the skin. The blistering principle is due to *Anacardic Acid*.

334. *Spondias mangifera*, Willd, H.F.B.I., II. 42, Roxb. 387.

Sans.:—Amrâtaka.

Pers.:—Darakhte-moryam.

Vern.:—Amra, amara, ambodha (H.); Amra (B.); Tangrong (Gar.); Kâtmâa (Tam.); Aravi mamadi (Tel.); Jangli am, ambâda (Bomb.); Amra, amara, ambodha, ambra (Hind.); Amra, ambra (Beng.); Amburri (Kol.); Amara (Assam); Tongrong;

adiat (Gar.); Amara (Nepal); Kouchiling (Lepcha); Kat, Amboham (Mal. S. P.); Ambuda (Uriya); Ambera (Kurku); Hamara (Coond); Amra, amurs, bohamb, amara, amabara (Kumaon), (Bahamo); Ambara (P. B.); Ran-amb, jungli am (Deccan); Ambada, jangli-am, ambada, amra amarah, (Bomb.); Ro amba, ambada (Mar.); Kat-maa, rhanamb, mariman, chedi, katmora, Ampullai (Tam.); Puille, kaders ambala chettupita, briksh, amnivuru, mamidi, amatum, adivio-mamadie toura mamidi (Tel.); Amte, ambatte mara, amate, pundi (Kan). Corre, kyoroe (Burm); *Æmberaella* (Sing.); Darakhte-moryam (Pers.).

Habitat.—Throughout India, from the Indus eastwards and southwards to Molacca and Ceylon.

A large, glabrous, deciduous tree. Bark smooth, aromatic grey, with short shallow, longitudinal wrinkles. Wood soft, light grey. Leaves 1-1½ ft.; petiole slender. Leaflets 3-5 pair, quite entire, elliptic-oblong, acuminate 2-9 by 1-4 in., shortly petiolulate, shining, more or less oblique; secondary nerves nearly straight, 10-20 pair, joined at the ends by a prominent nerve, running along and close to the edge of the leaf-blade. Flowers pentamerous, white, nearly sessile, clustered on stout ramifications of a sparingly-branched, terminal panicle, polygamous, nearly sessile. Calyx 5-toothed, deciduous. Petals 5, about ⅓ in. long, oblong, greenish white, spreading. Disk cupular, crenate. Stamens 10, inserted below the disk; filaments subulate, shorter than the petals; anthers versatile. Ovary sessile, free. Carpels 4-5 distinct in flower, coalescing into a single stone in the carpels. Drupe 1½-2 in. long, ovoid or oblong, fleshy, smooth, acid and rose-scented, yellow when ripe. Putamen fibrous and filled with cavities outside. Seeds 2-5, of which only one is perfect.

Parts used.—The fruit, bark, leaves and gum.

Use.—The pulp of the fruit is acid and astringent, and is considered useful in bilious dyspepsia (Dymock). The bark is sometimes used as a refrigerant medicine (T. N. Mukerji). It is also useful in dysentery; and the juice of the leaves is used for ear-ache (Atkinson).

The fruit is an useful antiscorbutic. The gum, in the form of mucilage, is a useful adjunct to other medicines for the purpose of suspending heavy powders, etc. The pulp, when boiled, has a faint rosy smell.

N. O. CORIARIÆ.

335. *Coriaria nepalensis*, Wall. H.F.B.I., II. 44.

Vern—Masuri, makola, (H.); Lizaklo, (Sutlej); Raselwa, archarru, pajerra (Simla); Bhojinsi, (Nep.); Mosroi, Gangeru, Gangaru (Jaunsar); Ayar (Kumaon); Gogsa, Makala (Garhwal), Tons Valley.

Habitat :—Jaunsar and Tehri-Garhwal, 4-8,000 ft., fairly common among shrubby vegetation on hill sides and in ravines, occasionally in the Saharanpur Siwaliks, *e. g.*, Chillawali Ran. Outer Himalaya, from the Indus to Bhutan, ascending to 8,000 ft. in the west and to 11,000 ft. in Sikkim. The name of the Hill Station Mussoorie (properly Masuri) is said to have been caused by the abundance of this plant on the site.

A deciduous, straggling shrub or small tree, says Gamble. A large shrub with long spreading branches, says Kanji Lal. Bark reddish brown, rough. Wood grey, hard, beautifully mottled. No heart-wood. Branchlets quadrangular. Leaves 2-4 by 1-2½ in., ovate oblong, cordate, acuminate, obscurely serrulate, 3-7-nerved at the base, sometimes puberulous beneath. Petiole 0-½ in. long. Racemes 2-6 in. long, usually clustered. Flowers ½ in. diam., greenish yellow. Fruit ½-⅔ in. diam., dark-brown or black.

Fl.—April, May. Fr.—June and July. Fruit edible. Branches browsed by sheep.

It is called the Mussoorie-berry (Kanji Lal).

Use.—The leaves are used to adulterate senna, and act as a poison in large doses. The fruit is said to produce symptoms like tetanus (Watt).

N. O. MORINGACEÆ.

336. *Moringa pterygosperma*, Gaertn, H.F.B.I., II. 45.

Syn. — *Hyperanthera moringa*, Vahl, Roxb. 368

Eng. Drumstick plant; Horse-radish.

Sans. Sigru-vaikalam, Sobhâñjan-vaikalam, Sobhâñjân-mûlam, Sigru-mûlam, Sobhâñjan-pushpam, Sigru-pushpam.

Vern.—Of the flowers—Sajnah-kê-phûl, Sêgvê-kê-phûl, Sahinjan-kê-phûl, *Hind.* Mungê-kê-phûl, *Duk.* Murungai-pû, *Tam.* Munaga-puvvu, *Tel.* Murinna-pû or Muringa-pû, *Malyal* Nugge-gida-huvvu, Nugge-havvu, *Can.* Sôjna-phûl, *Sajinaphûl*, *Guz.* Munga-cha-phûla, *Mah.* Murangâmûl, *Cing.* Dondalon-pôên, *Bur.*

Of the bark—Horse-radish bark, *Moringa* bark, *Eng.* Sajnah-ki-*chhâl*, Sêgvê-ki-*chhâl*, *Hind.* Mungê-ki-*chhâl*, *Duk.* Murungai-pattai, *Tam.* Munga-patta, *Tel.* Muringa tól, *Malyal.* Nugge-grida-patte, *Can.* Sôjna-sâl, *Beng.* Mungâ-cha-patte, *Balâdi-shingâ-chapatte*, *Mah.* Muranga-potta, *Cing.* Dondalon-khav, *Bur.*

Of the root-bark—Horse-radish root-bark, *Moringa* root-bark, *Eng.* Sajnuh-ki-jar-ki-*chhâl*, Sêgvê-ki-jar-ki-*chhâl*, *Hind.* Mungê-ki-jar-ki-*chhâl*, *Duk.* Murangai-vêr-pattai, *Tam.* Munaga-veru-patta, *Tel.* Muringa-vêra-tól, *Malyal.* Nugge-bêru-patte, *Can.* Sôjna-mûl-sâl, *Beng.*

Of the root—Horse-radish root, *Moringa*-root, *Eng.* Sahjanâ-ki-jar, Sêgvê-ki-jar, *Hind.* Munge-ki-jar, *Duk.* Murangai-vêr, *Tam.* Munaga-vêru, *Tel.* Muringa-vêra, *Malyal.* Nugge-bêru, Nugge gida-bêru, *Can.* Sojnâ-mûl, *Beng.* Sajina-jad, *Guz.* Dondalonmi, *Bur.*

Habitat.—Forests of Western Himalaya, Oudh, and cultivated elsewhere, throughout India.

A fairly large, pretty tree. Bark 1 in. thick, corky, grey, with longitudinal cracks. Roots pungent, with the taste of horse-radish. Wood-cells large, prominent. Leaves 1-2½ ft. long,

usually 3-pinnate; petioles, sheathing at the base; pinnæ opposite, 4-6 pair; pinnules opposite, 6-9 pair, the uppermost 1-foliolate; a hairy gland between each pair of pinnæ and pinnulæ. Ultimate leaflets opposite, $\frac{3}{4}$ - $\frac{1}{2}$ in. long, obovate or elliptic, entire, membranous, pale beneath. Flowers lin. diam., strongly honey-scented. Sepals linear-lanceolate, reflexed. Petals $\frac{1}{2}$ - $\frac{3}{4}$ in. long, linear spatulate, white, with yellow dots near base. Filaments villous at base. Ovary hairy. Capsule 9-20 in. long $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, 3-gonous, linear, pendulous, longitudinally ribbed, slightly constricted between the seeds. Seeds 3-cornered, winged at the angles, about lin. long, including the wings.

It is one of most easily propagated trees of the Western peninsula by cuttings. Flowers and fruits in abundance twice or at times, thrice a year.

Use.—The root is described by the Sanskrit writers as acrid, pungent, stimulant and diuretic, and is applied externally as a rubefacient. The seed is said to be stimulant, and is given in ascites arising from enlargement of the liver and spleen.

The root and bark abortifacient. Kanai Lal Dey, quoted by Chevers (I. B. Lyons Medical Jurisprudence). See, K. R. Kirtikar's 'Poisonous Plants,' Bombay, P. X. JI. Bombay N. H. Society, Vol IX.

A decoction of the root-bark is recommended to be given with asafœtida and rock salt in inflammation, abscess and calculous affections. The gum of the tree, mixed with sesamum oil, is recommended to be poured into the ears for the relief of otalgia (Dutt).

Mahomedan writers describe the flowers as hot and dry, and consider that they expel cold humours, disperse swellings, act as a tonic and diuretic, and increase the flow of bile. The juice of the root with milk is diuretic, antilithic and digestive, and is useful in asthma. A poultice made with the root reduces swellings, but is very irritating and painful to the skin. The pods have anthelmintic properties.

Ainslie says that the Native doctors prescribe it as a stimulant in paralytic affections and intermittent fever, in doses of

about one scruple; and that they also employ it in epilepsy and hysteria, and consider it a valuable rubefacient in palsy and chronic rheumatism. According to Fleming, the oil of the seeds is used as an external application for rheumatism in Bengal.

In Bombay, a decoction of the root-bark is used as a fomentation to relieve spasm. In the Concan the bark of the wild tree is ground with plumbago root, pigeon's dung and chicken's dung, and applied to destroy guinea-worms. Four tolas of the juice of the leaves of the cultivated tree are given as an emetic. The gum is said to be used to produce abortion; it would be quite possible to use it as a tent to dilate the os uteri, as it is very tough, and swells rapidly when moistened. The root is accepted by Europeans as a perfect substitute for horse-radish (*Dymock*). The seeds (called by the French *poisqueniques* and *chicot*, are used in venereal affections in Sindh (Murray).

The fruit is administered by Hakeems in affections of the liver and spleen, articular pains, tetanus, paralysis, &c. The root is used for soreness of the mouth and throat; and the gum for dental caries (Honnigberger).

The fresh root is stimulant, carminative, stomachic and stimulant-diuretic; and the flowers also possess a slight stimulant property. The bark and root-bark used externally are rubefacient and vesicant.

I have found the root in the form of "compound spirit" very useful in fainting, giddiness, nervous debility, spasmodic affections of the bowels, hysteria and flatulence. The flowers are often resorted to as an aphrodisiac by the Native medical practitioners in Southern India; but they have completely failed in my hands, though I have tried them in very large doses. They are at most a slight stimulant, but have not been found useful even as such in any particular disease. Applied externally, in the form of a paste, the fresh root-bark and the bark act as a good vesicant and rubefacient. The former is much superior to the latter in this respect (Moodeen Sheriff.)

The seeds yield oil of ben, which formerly had a reputation of being a thin oil suitable for fine machinery. Jamaica seeds consist of 40 per cent. of husks

and 60 per cent. of kernels. The oil gave 60 per cent. of liquid oil and 40 per cent. of white solid fat. Seeds from Northern Nigeria contained 33.4 per cent. of oil. Meggitt (1907) obtained 25.65 per cent. of oil in the sweet variety and 22.62 per cent. in the bitter variety.

Lewkowitsch expressed the seed in two stages and obtained a cold pressed and a hot pressed oil. The examination of these two oils gave the following numbers: Specific gravity at 40°, 0.9018, 0.8984; acid value, 49.71, 100.5; saponification value, 179.5, 178.7; unsaponifiable matter, 1.67, 2.69 per cent.; iodine value, 100.3, 88; titer test of fatty acids, 32°, 38.2°.

Ben oil is said to consist of the glycerides of oleic, palmitic and stearic acids and of a solid acid of high melting point, probably arachidic acid. (*Agricultural Ledger* for 1911-12 No. 5 p. 136).

337. *M. Concanensis*, Nimmo. H.F.B.I., II. 45.

This may possibly be the red-flowered species, alluded to by Roxburgh (II 308), as occurring near Maldah (Fl. Br. Ind.).

Vern.:—Mooah (Sind.); Sainjnah (Raj.; Con.).

Habitat:—Rajputana, on dry hills, Sindh and the Concan.

A tree, glabrous except the young parts and the inflorescence. Bark thick, soft, corky. Wood white, soft. Pores large, often sub-divided, enclosed in white rings, scanty. Medullary rays fine, numerous, the distance between them less than the diameter of the pores (Gamble). Leaves generally bipinnate, very rarely tripinnate, reaching 1½ ft. long. Primary pairs 5-6, distant, 4-8 in. long, the primary rachis thickened at the base as well as the secondary articulation, with a gland at each articulation. Leaflets 4-6 pair, with an odd one, broadly elliptic or sub-orbicular, obtuse at both ends, often retuse at the apex, of variable size, $\frac{5}{8}$ -1½ by ½-1 in., pale beneath, articulated, with a slender petiole $\frac{1}{2}$ -½ in. long; nerves 4-8 pair, slender, distinct. Flowers in lax divaricate, thinly pubescent panicles, reaching 1½ ft. long, pedicels $\frac{1}{3}$ -½ in. long, articulated with the flower; bracts minute, caducous. Flowering time. October to December. Calyx thinly tomentose, about $\frac{1}{3}$ -½ in. long; segments white, oblong, reflexed. Petals yellow, veined with red, oblong, or oblong-spathulate, the lower about $\frac{5}{8}$ in. long. Stamens 5-fertile and 4-5 stamodes; filaments hairy at base. Capsule straight, acutely triquetrous, slightly constricted between the seeds 1-1½ ft. long; valves hard, $\frac{1}{2}$ -¾ in. broad.

Seeds white or pale yellow, 3-angled, $\frac{2}{3}$ - $\frac{3}{4}$ in. long, 3-winged. Wings very thin, hyaline.

Use:—The roots, as of *M. pterygosperma*, have a pungent flavor, and are said to be used as a substitute for horse-radish. (Murray).

N. O. CONNARACEÆ.

338. *Rourea santaloides*, W. and A. H.F.B.I., II. 47.

Vern.:—Vardhâra (Bom.); Wâkeri (M.); Huleshadlabally (Kan.).

Habitat:—Western Peninsular, from the Concan to Travancore.

A semi-scandent or small tree. Branchlets slender. Bark shining, purplish; buds pubescent. Leaves imparipinnate, rachis, 3-6 in., slender, curved, glabrous. Leaflets often alternate, 1-3 pair (2 or 3 pair and a terminal one—Trimen), glabrous, coriaceous, very shortly stalked, shining above, 2-3 in., (2-5 in.—Trimen) oval or lanceolate. Elliptic or ovate-lanceolate, caudate-acuminate, rounded at base, with prominent reticulate venation beneath. Secondary nerves, arching, conspicuous. Flowers white, small, $\frac{1}{4}$ in., on slender jointed pedicel, with a minute, hairy bracteole at the joint; arranged in lax, slender, erect or ascending glabrous, racemose panicles, several of which arise from leaf-axil. Calyx-segments strongly imbricate, orbicular, very obtuse, glabrous. Petals much longer than sepals, oval-oblong, spreading. Stamens erect. Ovary glabrous; styles spreading. Fruit a capsule (Brandis), $\frac{3}{4}$ -1 in. long. Follicles $\frac{1}{4}$ in. or a little more, cylindric, falcately curved, tapering to a point, apiculate, striate, surrounded at base by a leathery cup formed of the much-enlarged and elongated sepals, dehiscing ventrally, i.e., along the inner suture. Arillus orange-coloured. Seed about $\frac{3}{8}$ in., oblong ovoid. Cotyledons plano-convex. Flowers in April, says Trimén; May-Oct., says Brandis.

Habitat:—Ceylon up to 3,000 ft. Malabar coast, evergreen forests of the Western Ghats, from the Concan southwards.

Singhalese (Kirindi-wel).

Use:—The root is used as a bitter tonic in rheumatism, scurvy, diabetes and pulmonary complaints. Many fanciful virtues are attributed to it by the Natives; it is believed to promote the growth of a foetus in utero, the development of which has been arrested (S. Arjun).

The root is also used as an alterative and tonic, for the same purposes as Sarsaparilla, in syphilis, &c. Externally, it is applied to ulcers and other skin diseases.

N. O. LEGUMINOSÆ.

339. *Crotalaria burhia*, Hamilt, H.F.B.I., II. 66.

Vern.:—Sis, sassi, meini, pola, khippi, buta, khep, bhata, bui, lataia, kharsan, kauriala (Pb.); Drunoo (Sind.); Ghâgti (Mar.); Ghangaro (Guz.)

Habitat:—In the sandy plains of Sind and Punjab, and the desert regions of Cambay. Western Rajputana and Guzerat. Also in Afghanistan.

An erect, pro-cumbent shrub. Branches numerous, slender, flexible and rush-like when young, stiff and rigid when old. Leaves simple, small and scanty. Stipules 0, linear or oblong. Flowers yellow, 6-12, far apart, on large raceme forming terminal, divaricate, rigid panicles. Calyx toothed, with long, dense, silky hairs; teeth lanceolate, as long as Corolla, $\frac{1}{4}$ – $\frac{1}{3}$ inch. Corolla yellow, scarce exserted (J. G. Bakar). *Pod* oblong, 3-4—seeded, rather longer than the Calyx.

Use:—The branches and leaves are used as a cooling medicine (Stewart).

340. *C. prostrata*, Roxb. H.F.B.I., II. 67, Roxb. 548.

Habitat:—Plains, from the Upper Ganges to Ceylon, ascending the Himalaya to 6,000 ft.; also in Upper Burma and Java.

Copiously branched herbs, with flexuous, trailing, slender stems, finely silky, or with yellowish brown hairs. Leaves close, simple, obovate-oblong, rather oblique; nearly sessile, 1-1½ in. long, obtuse, pale, glaucous below, produced (cordate)

on the lower side at the base. Stipules 0 or small, not decurrent. Peduncles finely silky, usually twice the leaves. Racemes all lateral, leaf-opposed, usually reduced to a few flowers; minute, hairy bracteole at the joint; arranged in lax, slender, erect or ascending glabrous, recenose panicles, several of which arise from leaf-axil. Calyx-segments strongly imbricate, orbicular, very obtuse, glabrous. Petals much longer than sepals, oval-oblong, spreading. Stamens only 2-4; bracts subulate, very minute. Calyx $\frac{1}{2}$ - $\frac{1}{3}$ in., densely silky; teeth linear, long. Corolla small, yellow, not exerted. Pod linear-oblong, glabrous, nearly sessile, $\frac{1}{2}$ - $\frac{5}{8}$ in. long, 12-15 seeded.

Use:—Used by the Santals in derangement of the stomach.

341. *C. albida*, Heyne. H.F.B.I., II. 71.

Syn. *C. montana*, Roxb. 547.

Vern. Ban-methi (H).

Habitat:—Tropical region through India proper and Ceylon, ascending to 5,500 ft. in Kumaon, and to 6-7000 ft. in the West Himalayas. Burma, Malay Peninsula and Islands, extending to China and the Philippines.

A perennial herb or small under-shrub, with short woody base and very numerous ascending, slender branches 6 in.-2 ft. long, covered with short, adpressed hair. Leaves numerous, rather close, small, $\frac{1}{2}$ - $\frac{3}{4}$ in., shortly stalked, linear-spathulate, acute at base, obtuse truncate or retuse at apex, apiculate, glabrous and minutely punctate above, silky with adpressed hair beneath, without stipules. Flowers bright yellow, small, numerous, on slender pedicels, secund, in lax terminal racemes. Bracts minute, often on the Calyx-tube. Calyx-segments $\frac{3}{8}$ in., the upper linear-oblong, very obtuse, the lower linear-lanceolate, acuminate, all very finely silky. Petals about as long as Calyx. Pod $\frac{1}{2}$ in., oblong-ovoid, not stalked, tipped with hooked base of style, glabrous, brown; seeds 6-12.

Use:—The root is used as a purgative.

342. *C. verrucosa*, Linn. H.F.B.I., II. 77.

Syn.:—*C. angulosa*, Lamk., Roxb. 550.

Vern.:—Ban-san (B. and H.); Vuttei-khilloo-khilloopie (Tam.); Ghelegherinta (Tel.); Tirat (Bom.).

Habitat:—Tropical regions of the Himalayas and Ceylon.

A copiously-branched, erect annual, scarcely shrubby, 2-3 ft. high. Branches at first puberulent, soon glabrescent, acutely-angled. Stipules foliaceous, $\frac{1}{2}$ -lunate, not decurrent. Leaves simple, thin, obscurely downy beneath, reaching 4-6 in., ovate, usually acute; the base deltoid, usually obtuse. Racemes moderately close, lateral and terminal, not paniced, 12-20-flowered, $\frac{1}{2}$ ft. or more long; bracts linear, very minute; pedicels equalling or shorter than calyx. Calyx $\frac{1}{4}$ in., obscurely downy, teeth lanceolate, twice the tube. Corolla twice the calyx, yellow, white and blue. Pod finely pubescent, 1-1 $\frac{1}{2}$ in. long, 10-12-seeded.

Uses:—The juice of its leaves is used in medicine; it is supposed to be efficacious in diminishing salivation. It is prescribed by the Tamil doctors, both internally and externally, in cases of scabies and impetigo (Ainslie).

343. *C. juncea*, Linn. H.F.B.I., II. 79, Roxb. 545.

Vern.:—San (H. and B.); Janab-ka-nar (Dec.); Jenappanar (Tam.); Jenapa-nara (Tel.) Ansâ suilâ (Assam); Sini, tâg-san (Sind.); Janapa, pulivanji (Mal.) Sanabu, shanabinâ, pundi (Kan.).

Habitat:—The plains of India.

A stiff annual herb, several feet high, with slender, virgate, rigid, thinly silky, terete, multisulcate branches. Stipules 0 or minute, subulate. Leaves simple, rather distant, linear or oblong, rather obtuse, firm, usually 1 $\frac{1}{2}$ -3 in., shining on both sides, with thin, short, brown, silky hairs. Bast fibre very valuable for cordage, known in commerce as Sunn. Racemes lateral and terminal, not paniced, loosely 12-20-flowered, reaching a foot long; bracts very minute, linear. Calyx $\frac{1}{2}$ - $\frac{3}{4}$ in. long, densely clothed, with ferruginous, velvety hairs: teeth linear-lanceolate, very deep. Corolla bright yellow, glabrous, slightly exserted. Pod 1-1 $\frac{1}{4}$ in. long, clothed with short-spreading persistent, silky hairs; 10-15-seeded.

Use:—The seeds are used to purify the blood.

344. *C. medicaginea*, Lamk. H.F.B.I., II. 81.

Syn. :—*C. procumbens*, Roxb, 551.

Vern. :—Gulâbi (Ph.).

Habitat :—Tropical regions of the West Himalayas and India.

A diffuse, perennial, herbaceous plant, with slender, much-branched stems, diffuse, $\frac{1}{2}$ -1ft. long, thinly silky upwards. Stipules setaceous, very minute, deciduous. Leaves trifoliate. Leaflets $\frac{1}{4}$ - $\frac{1}{2}$ in. long, retuse, emarginate, glabrous above, obscurely silky below. Petioles shorter than the oblanceolate leaflets. Racemes copious, 2-6-flowered, terminal and leaf-opposed. Peduncles exceeding the leaves ; bracts minute, linear. Corolla twice the calyx. Calyx thinly silky, campanulate, $\frac{1}{8}$ in. deep ; teeth linear, exceeding the tube. Corolla yellow. Pod. $\frac{1}{8}$ in. long, glabrescent, obliquely subglobose, small, sessile, 2-seeded.

Use :—This plant is officinal in the Punjab.

345. *Trigonella occulta*, Delile. H.F.B.I., II 87.

Habitat :—Sind, the Punjab and N.-W. Provinces.

An annual herb, diffuse, densely caespitose, glabrous or sub-glabrous, with slender stems, a few inches long. Leaves pinnately 3-foliate, toothed. Stipules deeply laciniate. Petioles exceeding the sharply-toothed, minute, oblanceolate cuneate leaflets. Flowers 2-4 together, in copious, sessile, axillary clusters. Calyx $\frac{1}{8}$ in., campanulate, teeth linear-setaceous. Corolla slightly exserted ; petals free from the staminal-tube. Pod elliptical, short, turgid, scarcely exserted, glabrous, usually 2-seeded.

Use :—The seeds are used in dysenteric affections (Murray).

346. *T. Fœnum-græcum*, Linn. H.F.B.I., II. 87, Roxb: 588

Sans. :—Methi.

Arab. :—Hulbah.

Pers. :—Shamlit.

Vern. :—Methi (B. and H.) ; Vendayam (Tam.) ; Mentulu (Tel.) ; Menthya (Kan.).

Habitat :—Cultivated in many parts of India, but is wild in Kashmir and the Punjab.

Annual, robust, erect, sub-glabrous herbs. Stipules not laciniate. Leaflets toothed, $\frac{3}{4}$ -1 in. long, oblanceolate oblong. Flowers 1-2, sessile in the axils of the leaves. Calyx $\frac{1}{4}$ - $\frac{1}{2}$ in., teeth linear. Corolla much exserted. Pod 2-3 in. long, turgid, 10-20-seeded, with a long, persistent beak, often falcate.

Use :—Fenugreek seeds are considered carminative, tonic, and aphrodisiac. Several confections made with this article are recommended for use in dyspepsia with loss of appetite, in the diarrhoea of puerperal women, and in rheumatism (*Hindu Mat. Med.*) An infusion of the seeds is given by the Natives to small-pox patients as a cooling drink. Mahomedan writers describe the plant and seeds as hot and dry, suppurative, aperient, diuretic, emmenagogue, useful in dropsy, chronic cough, and enlargements of the spleen and liver. A poultice of the leaves is said to be of use in external and internal swellings and burns, and to prevent the hair falling off. The flour of the seeds is used as a poultice, and is applied to the skin in cosmetic (*Dymock*). The use of fenugreek as a medicinal agent is now obsolete in Europe and the United States. Formerly the seeds were employed in the preparation of emollient cataplasms, fomentations and enemata, but were never given internally. The powdered seeds are still used in veterinary practice (*Bentley and Trimen*).

The seeds being toasted and afterwards infused are used by Native practitioners in Southern India for dysentery (*Ainslie*.) In the Concan, the leaves are used both externally and internally, on account of their cooling properties (*Dymock*).

Fenugreek.

Analysis of 2 samples gave the following results :—

Nitrogenous matter	...	...	13.74 and 13.02	p. c.
Fat	...	...	3.31 and 3.54	"
Crude fibre	...	...	31.75 and 29.36	"
Nitrogen-free extract	...	...	45.79 and 48.14	"
Ash	...	...	5.42 and 5.94	" in the dry matter.

The pure ash contained (per cent.)

	K ₂ O	Na ₂ O	CaO	MgO	Fe ₂ O ₃	P ₂ O ₅
1.	19.37	7.60	30.73	1.19	4.71	8.24
2.	18.85	7.55	28.92	0.96	5.08	7.87
	SiO ₂	SiO ₂	Cl.			
1.	4.35	21.97	1.23			
2.	3.91	25.19	0.99			

In composition, fenugreek resembles *Trifolium incarnatum*.—J. Ch. S. LXXVIII. pt. II. 1900, p. 364.

Trigonella Foenugræcum.

The crushed seeds yield only 0.0-14 per cent. of a light brown, neutral, volatile oil, possessing the distinct odour of the seeds. It has the sp. gr. 0.870 at 13.5° and $[\alpha]_D^{20} = +8^\circ$. It is readily soluble in absolute and 90 per cent. alcohol, but its solubility in 80 per cent. alcohol is only 1 : 460.—J. S. Ch. I., April 15, 1903, p. 439.

347. *Melilotus parviflora*, Desf., H.F.B.I., II. 89.

Syn.:—*Trifolium indicum*, Linn. Itob. 588.

Sans.:—Vana-methika.

Vern.:—Sinjee (Pb); Zir (Sind.); Banmethi (H.)

Habitat:—Western Peninsula, Bengal and U. P.

An under-shrub, 2-3ft. high, with firm, slender branches and membranous leaves, thinly clothed with adpressed grey hairs. The branches soon turn glabrescent. Stipules minute setaceous. Petioles $\frac{1}{2}$ - $\frac{3}{4}$ in. Leaflets always 3, obovate, the end one 1-1 $\frac{1}{2}$ in. long, stalked, the side ones opposite. Racemes congested, 6-12-flowered, usually sessile, seldom over an inch long. Calyx $\frac{1}{2}$ - $\frac{3}{4}$ in., white-canescens; teeth long, setaceous. Corolla purplish-red, twice the Calyx. Pod straight, tetragonous, 6-10-seeded, not torulose, $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long; the firm glabrescent valves obtusely keeled.

Use.—The seeds are said to be useful in bowel complaints and infantile diarrhoea, given as a gruel (Murray).

348. *M. officinalis*, Willd., H. F. B. I., II. 89.

Syn.:—*Trifolium officinale*, Willd. Roxb. 588.

Vern.:—Aspurk (H.); Tیره (Pers.); Bun-piring (B.).

Habitat:—Nubra and Ladak.

A biennial herb. Stem much taller than that of *M. parviflora*, Desf. Stipules linear, acuminate. Leaves, with toothed pinnately 3-foliate leaflets. Leaflets obovate or oblanceolate, retuse or emarginate. Racemes denser and not quite so long as *M. parviflora*. Calyx $\frac{1}{2}$ in. Corolla linear, yellow, odorous, usually three times as long as Calyx. Standard the same length as the wings and keel. Pod distinctly stipitate, hairy, $\frac{1}{8}$ in. long, 1-2-seeded; not obtuse.

Use:—Said to possess styptic properties, also employed in bruises (Watt.).

349. *Cyamopsis psoralioides*, D.C., H. F. B. I., II. 92.

Syn.:—*Dolichos fabæformis*, Willd., Roxb. 564.

Vern.:—Gowâr (H.); Kauri, phaliguar (Pb.); gawar or Godi bavachi (Bomb.); Buru raher (Santal).

Habitat:—Plains from the Himalaya to the Western Peninsula. Cultivated in Bombay, Surat, Ahmedabad, Deccan.

A robust, erect annual, 2-3 ft. high, clothed with adpressed grey hairs attached by the middle. Leaves 3-foliate. Leaflets $1\frac{1}{2}$ -3 by $\frac{1}{2}$ -2 in., elliptic, acute, sharply dentate (the teeth generally ending in a weak spine, clothed on both sides with adpressed medifixed hairs, base acute; main nerves prominent. Petiolules of the lateral leaflets $\frac{1}{8}$ in., those of the terminal ones $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Petioles 1-1 $\frac{1}{2}$ in. long, sparsely hairy. Stipules $\frac{1}{4}$ - $\frac{3}{8}$ in. long, linear setaceous, subulate persistent. Flowers small, 6-30 in. copious, close, short-peduncled, axillary, close racemes; pedicels short, hairy; bracts linear-subulate, persistent, $\frac{3}{16}$ in. long. Calyx hairy outside, 1- $\frac{1}{4}$ in. long to the extremity of the longest tooth; teeth very unequal, the lowest two the longest linear-subulate, the upper 3 shorter, triangular, acute. Corolla slightly longer than the Calyx; standard slightly orbicular. Anthers uniform, apiculate. Ovary sessile; many-ovulate; style incurved at apex; stigma capitate. Pod thick, fleshy, straight, sub-tetragonal, 1 $\frac{1}{2}$ -2 in. long, slightly pubescent. Seeds 5-6, square, slightly compressed.

Use :—Its stem and leaves appear to be officinal under the above name (Stewart). Pods used as a vegetable among the Hindus.

350. *Indigofera linifolia*, Retz., H.F.B.I., II. 92, Roxb. 582.

Vern. :—Torki (H.); Bhangra (B.); Taudikhode-baha (Santal); Burburra, pândharipâle, bhangra, torki (Bomb.).

Habitat :—From the Himalayas throughout India.

An annual; the whole plant persistently silvery, hoary. Stems slender, copiously branched, both at base and upward, $\frac{1}{2}$ -1 ft. Leaves simple, sub-sessile, $\frac{1}{2}$ -1 in. long, typically linear, acute, but varying to obovate, obtuse, with a mucro. Stipules minute, setaceous. Flowers 6-12; in copious, dense, sub-sessile Racemes. Calyx $\frac{1}{2}$ in., silvery; teeth long, linear-setaceous. Corolla bright red, 2-3-times the Calyx. Pod hard, mucronate silvery under, $\frac{1}{2}$ in. thick.

Use :—It is given medicinally in febrile eruptions (Honninger).

The Santals use the plant in amenorrhœa along with *Euphorbia thymifolia* (Revd. A. Campbell).

351. *I. glandulosa*, Willd. H.F.B.I., II., 94, Roxb. 583.

Vern. :—Vekhariyo (Guj.); Barbed (Sholapur); Gavachamatmaudi (Bomb.); Vekhariyo, baragadam, barapatalu, boomidapu, barapatam (Tel.).

Habitat :—Plains of the Western Peninsula and Bundelkhand.

An annual, with elongated, slender branches, clothed when young with spreading hairs not at all argenteo-canescens. Leaves distinctly petioled, always 3-foliate. Stipules setaceous, minute; petiole nearly as long as the leaflets. Leaflets oblanceolate, membranous, $\frac{1}{2}$ -1 in. long, green above; hairs adpressed, obscure, pale glaucous, with copious distinct black dots below. Heads $\frac{1}{4}$ - $\frac{3}{8}$ in. long, sessile. Corolla 3-4 times the Calyx. Calyx $\frac{1}{2}$ in., pubescent; teeth long, setaceous. Pod brown, finely

pubescent, oblong, $\frac{1}{2}$ in. long, globose 1-2-seeded, (1-seeded, says J. G. Baker).

Use:—The seeds are employed as a nutritive tonic.

352. *I. enneaphylla*, Linn., H.F.B.I., II. 94, Roxb. 584.

Sans.:—Vasuka.

Vern.:—Cheppoo-neringie (Tam.); Cherragaddaun (Tel.); Bhiuguli (Mar.); Kenneggilu (Kan.); Cheru-pullate (Mal.).

Habitat:—From the Himalayas throughout the plains of India.

A thinly, silvery-hoary annual or biennial. Stems densely caespitose, 1-1 $\frac{1}{4}$ ft., trailing, much-branched; leaves nearly sessile, 7-11-foliate, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long. Leaflets firm, oblanceolate, alternate; stipules minute, setaceous. Heads 12-20-flowered, dense, short peduncled or sessile. Calyx $\frac{1}{12}$ - $\frac{1}{8}$ in., hoary; teeth long, setaceous. Corolla slightly exserted. Pod oblong, 2-seeded, $\frac{1}{8}$ - $\frac{1}{6}$ in. long, cylindric, thinly hoary.

Use:—The juice of this plant is used as an antiscorbutic, alterative and diuretic; and is considered alterative in old venereal affections (Ainslie).

353. *I. aspalathoides*, Vahl., H.F.B.I., II. 94.

Syn.:—*I. aspalathifolia*, Roxb. 582, 583.

Vern.:—Shevenar-vaymboo (Tam.); Manueli (Mal.); Nil (Pb.); Shiva-malli (Kan.)

Habitat:—Plains of Carnatic.

A low undershrub, with copiously spreading, rigid, terete, woody branches and argenteo-canescens branchlets. Leaflet 1-5, pale green, with a few obscure adpressed hairs, oblanceolate, $\frac{1}{12}$ - $\frac{1}{4}$ in. long, often complicate. Pedicels erecto-patent, $\frac{1}{8}$ - $\frac{1}{4}$ in., almost as long as the leaf, much shorter than the pod. Calyx scarcely $\frac{1}{4}$ in.; teeth long, linear. Corolla red, $\frac{1}{2}$ in. Pod straight, glabrous, turgid, $\frac{1}{2}$ - $\frac{5}{8}$ in. long. 6-8-seeded.

Uses:—The leaves, flowers and tender shoots are said to be cooling and demulcent, and are employed in decoction, in leprosy and cancerous affections. The root is chewed as a

remedy for toothache and aphthæ. The whole plant, rubbed up with butter, is applied to reduce œdematous tumors. A preparation is made from the ashes of the burnt plant to remove dandruff from the hair. The leaves are applied to abscesses; and an oil is obtained from the root which is used to anoint the head in erysipelas (Ainslie and Rheede).

354. *I. trifoliata*, Linn., H.F.B.I., II. 96.

Syn.:—*I. prostrata*, Willd., Roxb. 583.

Vern.:—The seeds—Wekaria (Bomb.).

Habitat:—From the Himalayas throughout India.

Use:—The seeds are prescribed along with other mucilaginous drugs as a restorative (Dymock).

355. *I. paucifolia* Delile., H.F.B.I., II. 97, Roxb. 583.

Vern.:—Kuttukkârchammathi (Tam.).

Habitat:—The plains of Sind and the upper Gangetic basin.

A shrub, reaching 4-6ft., with copious woody branches which, along with the sub-coriaceous leaves, are argento-canescens. Leaflets 3-5, alternate, firm, oblanceolate oblong, $\frac{1}{2}$ -1 in. long, sometimes solitary on the branches; petiole short, but distinct. Racemes short-peduncled, 20-50-flowered, reaching 3-4 in. long. Calyx silvery $\frac{1}{4}$ in.; teeth lanceolate, cuspidate, as long as the tube. Corolla red, 3-4-times the Calyx, thinly silvery externally. Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long, glaucous, distinctly torulose, 6-8-seeded, recurved.

Parts used:—The root and stem.

Uses:—It is considered an antidote to poisons of all kinds. The root boiled in milk is used as a purgative, and a decoction of the stem as a gargle in mercurial salivation (Watt.)

356. *I. tinctoria*, Linn. H.F.B.I., II. 99, Roxb. 585.

Sans.:—Nila.

Vern.:—Nil (H. B.); Averi (Tam.); Ameri (Malay.); Neelie (Tel.); Nil guli (Bomb.); Jil, nil (Sind.).

Eng.:—Common indigo.

Habitat:—Cultivated throughout India, for Indigo.

This is the universally cultivated Indigo.

A shrub, 4-6ft. high, with twiggy, woody, thinly silvery, branches. Leaves 1-2in. long, leaflets 9-13, large, obovate-oblong, opposite, membranous, turning blackish when dried; petiole $\frac{1}{2}$ -lin. Racemes lax, nearly sessile; 2-4in. long. Flowers small. Calyx $\frac{1}{4}$ in., silvery, teeth as long as the tube. Corolla $\frac{1}{8}$ - $\frac{1}{6}$ in., reddish-yellow. Pod $\frac{3}{4}$ -lin. long, $\frac{1}{12}$ in. thick, glabrescent, nearly straight, scarcely at all recurved, 8-12-seeded, not torulose.

Uses:—Both Hindus and Mahomedans consider the plant to have attenuant properties; they prescribe it in whooping cough, affections of the lungs and kidneys, palpitation of the heart, enlargement of the spleen or liver, and dropsy. Indigo applied to the navel of children is said to act upon the bowels; it is applied to the hypogastrium to promote the action of the bladder. A poultice or plaster of the leaves is recommended in various skin affections, and is used as a stimulating application to old ulcers, hæmorrhoids, &c. Indigo is applied to the bites and stings of venomous insects and reptiles to relieve the pain, also to burns and scalds. Ainslie notices the use of the root by the Hindus in hepatitis (Dymock.)

The extract is given in epilepsy and nervous disorders.

It is also used in bronchitis, and as an ointment in sores (Watt).

An infusion of the root is given as an antidote in cases of poisoning by arsenic. (Surg. Thomas in Watt's Dictionary).

357. *I. pulchella*, Roxb. H.F.B.I., II. 101, Roxb. 585, 586.

Vern.:—Sakena, hakua (H.); Uterr, jhurpur (Kol.); Darehuter, lili-bichi (Santal); Hikpi (Lepcha); Girhul (Kharwar); Baroli (Mar.); Togri (Bhil.); Chimmâti; Nirda (Mahableshtar).

Habitat:—Throughout the Himalayan tract and the hills of India.

A shrub, 4-6 ft. high, the trunk reaching the thickness of a man's leg. Branches sulcate, thinly coated with grey adpressed hairs at first, soon glabrescent. Leaves short-petioled, 3-6in. long; leaflets opposite, obtuse, often emarginate, usually $\frac{3}{4}$ -lin. long, pale green above, glaucous below, thinly coated, with short

adpressed grey hairs, ovate-oblong, 13-17, subcoriaceous. Stipule abortive or very minute; bracts exceeding the buds, usually boat-shaped, with cusp. Racemes short-peduncled, moderately close, 1-3 in. long; pedicels short. Calyx $\frac{1}{2}$ in. long, argento-canescens; teeth short, deltoid. Corolla bright red, glabrous externally, generally $\frac{3}{8}$ - $\frac{1}{2}$ in., reaching $\frac{3}{4}$ in. long; the standard $\frac{3}{8}$ in. broad, reflexed in the expanded flower. Pod straight, turgid, glabrous, $1\frac{1}{4}$ - $1\frac{1}{2}$ in. long, 8-12-seeded.

Part used:—The root.

Use:—A decoction of the root is given by the Santals for cough; and a powder of the same is applied externally for pains in the chest (Revd. H. Campbell).

The interesting 'Notes on Indigoferæ,' recently published by Dr. Prain and Mr. E. Baker in the Journal of Botany, reveal many facts, which, apart from their historical and geographical interest, are of great importance in regard to indigo-culture in India. In their opinion, *I. tinctoria* (taken in the wide sense) may be considered as representing 3 distinct forms, as follows:—

FORM 1. This is the wild indigo which was found in Nubia by Kotschy in 1841; and specimens agreeing with it have since been collected in Central India. The plant was probably unknown to Linnæus and also to DeCandolle. Regarded as a distinct species, its correct name would be *I. Bergii*, Vatke.

FORM 2. This is the southern, or the Madras and Ceylon cultivated indigo. It is also *I. tinctoria*, Linn. Sp. Pl. (in part), and DeCandolle's var. *macrocarpa* of that species. It is found in a semi-wild state in the Jumna ravines, near Agra and Muttra, also in Merwara (Rajputana), where it is not, and probably never has been, cultivated. It is called "*Jinjini*" in Rajputana, where its seeds are collected and eaten in years of scarcity, no other use being made of the plant. This form has been collected in a similar wild condition in many other localities more or less distant from its true area of cultivation.

FORM 3. *I. sumatrana*, Gærtn. *Fruct.* ii, 371, t. 148. Syn. *I. indica*, Lamk.—Vern. Nil. This is the northern cultivated form of indigo, extending from Behar and Tirhut to the Punjab, where its area meets that in which some form of *I. argentea* is grown, and southwards to the Circars, where its area approaches that of the Madras cultivated form of *I. tinctoria*. According to Dr. Prain, this is the form that was first introduced into the W. Indies from the E. Indies, and in America it is the usual one met with. It also occurs in Trop. Africa, and in Formosa. It may be distinguished botanically from the southern form by its leaflets, which are larger, and ovate-oblong or oblong, instead of obovate or sub-orbicular. The pods also of *I. sumatrana* are shorter, thicker and blunter at the apex, and they are usually more numerous and straighter than in the Madras form. This northern form of indigo is an important rainy-season crop within the area. (Duthie's *Flora* of the Upper Gangetic Plain, Vol. I. p. 255).

358. *Psoralea corylifolia*, Linn. H.F.B.I., II. 103, Roxb. 588.

Sans.:—Sugandha, kantik, avalgiga, vākuchi, sonia-rāj.

Vern.:—Buckchi, bābchi (H.); Hakuch (B.); Bāwachi (Bomb.); Karpoo-garishi, karpugan, karu, bogi-vittulu (Tam.); Kourgestum, bapungie (Tel.); Kourkoal (Mal.); Bawchan (Duk.); Babehi (Pb.).

Habitat:—Plains; from the Himalayas throughout India proper.

An erect, annual, herbaceous under-shrub, 1-3 ft. high. Branches firm, copiously gland-dotted. The plant under preservation lives for several years, six or seven or even more, reaching a height of 6 or 7 ft. Leaves simple, distinctly petioled, roundish, 1-3 in. long, inciso-repand, firm in texture, both sides conspicuously dotted with black dots, very glabrescent. Racemes dense, short. Flowers 10-30, in dense, copious, long-peduncled heads. Calyx nearly sessile, $\frac{1}{2}$ in., teeth lanceolate, long, the lowest long. Corolla yellow, a little exserted. Pod small, black, sub-globose, glabrous.

Use:—Native works on *Materia Medica* describe the seeds as hot and dry, or, according to some, cold and dry, laxative, stimulant and aphrodisiac. They are recommended in leprosy, and other chronic skin diseases, and are given internally and applied externally as a plaster; they are also said to be useful in bilious affections and as an anthelmintic (Dymock).

In southern India, they are used as a stomachic and deobstruent, and prescribed in lepra and other cutaneous diseases (Ainslie).

An oleature of Bāvchi for use in leprosy internally and externally was once prepared by Mr. D. S. Kemp, so far back as 1870.

In the Concan, the seeds are used in making a perfumed oil which is applied to the skin (Dymock.). Rai Bahadur K. L. Dey speaks highly of the oleo-resinous extract of the seeds, diluted with simple ointment, as an application to leucoderma. After application for some days the white patches appear to become red or vascular; sometimes a slightly painful sensation

is felt. Occasionally some small vesicles or pimples appear; and if these be allowed to remain undisturbed they dry up, leaving a dark spot of pigmentary matter, which forms as it were a nucleus. From this point, as well as from the margin of the patch, pigmentary matters gradually develop which ultimately coalesce with each other, and thus the whole patch disappears. It is also remarkable that fresh patches are arrested by its application (Ph. J., Sept. 24th, 1881). Extensively tried in Bombay by Bhao Daji and others as a remedy in leprosy, and, I believe, with some success. Several species of *Psoralea* have been used medicinally in America, and have been found to act as gently stimulating and tonic nervines. Tried in leprosy with a certain amount of success (Dymock.)

The seeds yield 20·15 per cent. of a thick, reddish-brown oil to ether.

Fat : Specific gravity at 100°, 0·9107 ; acid value, 39·18 ; saponification value, 204·6 ; Reichert-Meissl value, 6·9 ; iodine value, 79·9 ; unsaponifiable, 1·73 ; butyro-refractometer at 25°, 79·5°.

Fatty acids (insoluble) : per cent. 88·3 ; melting point, 32·8 ; iodine value, 83·06 ; neutralisation value, 192·4 ; mean molecular weight, 291·5. (A. K. Menon.) (*Agricultural Ledger* 1911-12—No. 5, p. 139.)

359. *Colutea arborescens*, Linn. *Var Nepalensis*,
H.F.B.I., II. 103.

Vern. :—Brâa (Ladak).

Eng. :—The Bladder Senna.

Habitat :—Arid valleys of the inner Himalayas.

A sub-glabrous shrub, 6-10 feet high, unarmed. Leaves imparipinnate; leaflets 9-13, obovate, pale green, $\frac{1}{4}$ – $\frac{3}{8}$ in. long, often emarginate, obscurely silky in the young state. Racemes as large as the leaves, axillary, laxly 3-4-flowered. Flowers yellow, showy. Calyx $\frac{1}{8}$ – $\frac{1}{4}$ in. Corolla $\frac{3}{4}$ inch long; standard furnished at the base with two nipple-shaped papillæ. Pod $\frac{1}{2}$ –2 in. long, faintly downy when young, splitting at tip before ripening.

Use :—The leaves of this plant are purgative, and are used to adulterate officinal senna. (U. S. Dispensatory).

360. *Mundulea suberosa*, Benth. H.F.B.I., II. 101.

Syn.:—*Robinia suberosa* and *R. Senuoides*, Roxb. 568.

Habitat:—Hill-valleys of the Western Peninsula and Ceylon.

A stout, erect shrub, with thick corky bark. Branches, rachises, pedicels and leaves beneath densely sericeous. Leaves odd-pinnate. Leaflets 6-10-jugate, oblong, lanceolate, coriaceous, 1½-2 in. long. *Flowers* in close, terminal racemes. Pedicels 2-3 times the campanulate Calyx. Corolla ¾-1 in. long, reddish, thinly silvery. Pod 3-4 in. long, densely sericeous, 6-8 seeded, both sutures thickened, so as to form prominent borders.

Uses:—The seeds are used in Southern and Western India as a fish poison. They stupefy the fish, which are then readily taken by the hand.

The seeds and bark contain a greenish yellow resin, soluble in carbon bisulphide, benzol, chloroform, amylic alcohol, ether, hot alcohol, and partly in caustic alkalis, with a bright yellow colour.

The leaves contain, besides the resin, an organic acid and 9 per cent of ash [Pharmacographia Indica, Vol. I., p. 417].

361. *Tephrosia purpurea*, Pers. H.F.B.I., II. 112.

Syn.:—*Galega purpurea*, Roxb. 587.

Sans.:—Sarapunkha.

Vern.:—Sarphunka (H.); Ban-nil (Beng.); Bansa (Pb.); Jangli-kulthi (Bomb.); Kolluk-kây-velai (Tam.); Vempali (Tel.) Jhila (Guz.); Hun, nâli, jangli-kulthi (Dec.); Kozhin-nila (Mal.).

Habitat:—From the Himalayas throughout India.

A copiously-branched, sub-erect, herbaceous perennial. Stem glabrescent or finely downy, 1-2 ft high, slender, terete. Leaves odd-pinnate, short-petioled, 3-6 in. long. Stipules linear, subulate, ascending or reflexed; leaflets 13-21, narrow, oblanceolate, obtuse, green, glabrescent above, glaucous, obscurely silky below. Racemes copious, all leaf-opposed, 3-6 in. long, lax; lower flowers fascicled; pedicels 1/8-1/4 in., bracts minute. Calyx ½-¾ in., closely silky. Calyx teeth narrow, cuspidate, as long as the tube. Corolla 1/4-1/2 in., red, thinly silky. Pod 1½-2 by 1/6 in., broad glabres-

cent, or finely downy, slightly recurved, 6-10-seeded. Style subglabrous, penicillate at the tip.

Parts used :—The root, root-bark and seeds.

Uses :—Native works on Materia Medica describe this plant as deobstruent and diuretic, useful in cough and tightness of the chest, bilious febrile attacks, obstructions of the liver, spleen and kidneys. They recommend it as a purifier of the blood and for boils, pimples, &c. The author of the Makhzan mentions its use in combination with Cannabis Indica leaves (two parts of the former to one of the latter) as a remedy for bleeding piles, and with black pepper as a diuretic, especially useful in gonorrhœa (Dymock).

The root is bitter and given by Native practitioners in dyspepsia and chronic diarrhoea (O'Shaughnessy).

The plant is used internally as a purifier of the blood, and is considered a cordial. An infusion of the seeds is given as a cooling medicine (Dr. Stewart).

The plant appears to act as a tonic and laxative (Dymock).

In Ceylon, it is employed as an anthelmintic for children (Thwaites).

In the Punjab, an infusion of the seeds is believed to be cooling (Stewart.)

Fresh root-bark, ground and made into a pill, with a little black pepper, is frequently given in cases of obstinate colic, with marked success (Surgeon-Major Levinge of Madras, in Watt's Dictionary.)

362. *T. villosa*, Pers., H.F.B.I., II. 113, Roxb. 587.

Vern. :—Vaykkavalai (Tam.)

Habitat :—From the Himalayas to Ceylon.

Habit of *T. purpurea*, but stems lanceolate, firmer and more woody, clothed with short, adpressed white hairs. Leaves nearly sessile, 2-3 in. long, stipules linear, ascending or reflexed. Leaflets 13-19, grey green, glabrescent above, persistently silky below, narrow, oblanceolate, often emarginate. Raceme half a foot or more long. Lower flowers indistinct, fascicled,

often in the axils of the leaves; pedicels very short, bracts setaceous, plumose. Calyx $\frac{1}{2}$ in. deep, densely silky; teeth setaceous, lower exceeding the tube. Corolla pale red, not much exceeding the calyx. Pod 1-1½ in. long, 1/6-1/5 in. broad, densely, persistently white, velvety, much recurved, 6-8-seeded. Style glabrous, flattened, penicillate at the tip.

Use.—In Pudukota, the juice of the leaves is given in dropsy. (Pharm. Ind.)

363. *Sesbania ægyptica*, Pers., H.F.B.I., II. 14.

Syn.—*Æschynomene sesban*, Linn., Roxb. 570.

Sans.—Jayanti.

Vern.—Jêt râsin (H.); Ravasin (Dec.); Jayanti or Byojainti (B.); Shevari (Mar.); Jait, jaintar (Pb.); Champai, carcum chembai (Tam.); Kedangu (Mal.); Suiminta (Tel.).

Habitat.—From the Himalayas throughout the plains of India.

A weedy, tree-like herb, 6-10ft. high, or 15-20ft. at times, short-lived soft-wooded. Bark brown. Wood white, extremely soft. Leaves paripinnate, numerous rachis 2½-4in., slightly pilose, without prickles, furrowed above, swollen at base, 3-6ft. long. Leaflets 9-20 pair, linear-oblong, very shortly stalked, ½-3in., obtuse, apiculate, glabrous or nearly so, rather glaucous. Branches nearly glabrous, young parts silky. Flowers few, rather large, on very slender pedicels, in very lax, slender, pendulous axillary, stalked racemes. Calyx glabrous, broad, companulate; segment very shallow, acute. Pod 8-9in., pendulous, very narrowly linear, dehiscent, sharply beaked, usually somewhat twisted, weak, slightly torulose. Seeds 30 or more, greenish grey, separated by distinct transverse bars. The flowers are pale yellow, the standard dotted on the back with purple, or orange and purple (Brandis).

Uses.—The author of the Makhzan says that the seeds reduce enlargement of the spleen (Dymock). The seeds are applied in the form of ointment to eruptions, for which the juice of the bark is also given internally. They are also said to be stimulant emmenagogues (Wait).

The leaves are applied in the form of a poultice to hydrocele and rheumatic swellings; also to promote absorption or supuration of boils and abscesses (T. N. Mukerji).

In the Punjab, the seeds are applied externally, mixed with flour, for itching of the skin.

In Dacca, the juice of the fresh leaves is given as an anthelmintic (Taylor).

The root, well bruised and made into a paste, is an excellent application for scorpion-stings (N. C. Dutt, in Watt's Dictionary).

364. *S. aculeata*, Pers., H.F.B.I., II. 114.

Syn.—*Æschynomene spinulosa*, Roxb. 570.

Vern.—Brihut-chakrand (H.); Dhanicha (B.); Errajilgna (Tam.); Bhuiavali, rānshevari (Mar.).

Habitat.—From the West Himalayas throughout the plains of India.

A soft-wooded, suffruticose, erect, herbaceous annual, reaching several feet high, the branches and leaf-rachis, with small, weak prickles. Leaves abruptly pinnate, reaching $\frac{1}{2}$ -1 ft. long; 8-10 times longer than broad; leaflets glabrous, 20-40 pair, linear, obtuse, mucronate; petioles usually sprinkled with minute cartilaginous points (W. & A.). Racemes axillary, peduncled, erect, lax, often about half the length of the leaves, few-flowered. Flowers pretty large (more than half an inch long), on slender pedicels. Calyx $\frac{1}{8}$ in., glabrous. Corolla $\frac{3}{8}$ - $\frac{1}{2}$ in., pale yellow; standard dotted with red. Pod 6-9 in. by $\frac{1}{8}$ in., straight or rather falcate, beaked with the persistent style.

Use.—The seeds are mentioned by Baden Powell in his list of drugs.

365. *S. grandiflora*, Pers., H.F.B.I., II. 115.

Syn.—*Æschynomene grandiflora*, Linn. Roxb. 569.

Agati *grandiflora*, Desv. *Coronilla grandiflora*, Willd.
Sans.—Vaka.

Vern.—Basna (H.); Bak (B.); Bagfal (Sunderbans); Agâstâ (Bomb.); Agati (Tam.); Avisi (Tel.); Agase (Kan.).

Habitat.—Cultivated in South India and in the Ganges, Doab, and in Bengal.

A short-lived, wooded tree, attaining 20-30ft., with virgate terete branches. Bark light brown, smooth. Wood white, soft. Leaves $\frac{1}{2}$ -1ft. long. Leaflets 10-30 pair, oblong, glaucous, 1-1 $\frac{1}{2}$ ft. long. Flowers 2-4in., short axillary racemes, 3in. long, red or white. Calyx lin. deep, glabrous, shallowly 2-lipped. Calyx-cup full of honeyed-juice. Pod 10-12in. long, or more, $\frac{1}{2}$ in. broad, compressed, tetragonous, falcate, firm, not torulose, the sutures much thickened.

Parts used.—The bark, leaves, flower, and roots.

Use.—In Bombay, the leaves or flowers are made use of by the Natives, their juice being a popular remedy in nasal catarrh and headache: it is blown up the nostrils and causes a very copious discharge of fluid, relieving the pain and sense of weight in the frontal sinuses. The root of the red-flowered variety, rubbed into a paste with water, is applied in rheumatism. From 1 to 2 tolas of the root-juice are given with honey as an expectorant in catarrh. A paste made of the root, with an equal quantity of stramonium root, is applied to painful swellings. The leaves are also said to be aperient (Dymock).

An infusion of the bark is given in small-pox (T. N. Mukerji).

The bark is very astringent and is recommended as a tonic by Dr. Bonavia (Ph. Ind.)

A poultice of the leaves is a popular remedy in Amboyna for bruises. The juice of the flowers is squeezed into the eyes to relieve dimness of vision (Murray).

The flowers and pods are used in Bombay in curries and fritters. The taste of the pods, when cooked as a vegetable is, somewhat mawkish. Some don't mind the mawkish taste, and eat them largely (K. R. K.).

363. *Astragalus tribuloides*, Delile, H. F. B. I., II. 122.

Vern.:—Ogái (Pb.).

Habitat:—Plains of the Punjab.

Annual weeds, with basifixed hairs. Stems slender, densely caespitose, trailing, $\frac{1}{2}$ ft., densely clothed upwards, with ascending white hairs. Leaves distinctly petioled, 1-2 $\frac{1}{2}$ in. long; leaflets mostly close, densely clothed, with long white hairs on both sides. 13-15, oblong-lanceolate, acute. Stipules minute. Heads dense, sessile, 6-10-flowered. Calyx tubular $\frac{1}{8}$ - $\frac{1}{6}$ in., densely matted; teeth setaceous, shorter than the tube. Corolla pale yellow, little exserted. Pods $\frac{3}{8}$ in. long, turgid, linear oblong, densely pubescent, the cluster often spreading from the stem, like the spokes of a wheel from the axis. Stigma glabrous; seed 10-12.

Use:—The seeds are used medicinally, on account of their demulcent properties.

364. *A. hamosus*, Linn. H.F.B.I., II. 122.

Vern.:—Taj-badshahi, katila, pûrtûk, parang (H.); Akbil-ul-malik (Pb.).

Habitat:—Plains of the Punjab at Lahore and Peshawar.

Annual weeds, with basifixed hairs. Stem hairy, robust, 1-2 ft. Leaves distinctly petioled, $\frac{1}{4}$ - $\frac{1}{2}$ ft. long; leaflets distinctly stalked, pale green $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 13-25, oblong, emarginate, glabrescent above or thinly matted with silvery hairs on both sides. Heads 6-20-flowered; peduncles much shorter than the leaves, dense. Flowers small, yellow. Calyx $\frac{1}{6}$ in., matted with mixed black and white hairs, teeth subulate, as long as tube. Corolla half as long again as the Calyx. Pod $\frac{1}{2}$ -1 in. long, cylindrical quite glabrous, much recurved, nearly bilocular, 16-18-seeded. Stigmas glabrous.

Use:—It has emollient and demulcent properties, and is useful in the irritation of the mucous membranes. The pods are officinal.

Is laxative and used in nervous affections; made into a paste with vinegar it is employed externally in headaches. Is said to be lactagogue and to be used in catarrhal affections (Dr. Emerson.)

365. *A. multiceps*, Wall. H.F.B.I., II. 134.

Vern.:—Kandiâra, kâtarkanda, pisar, sarmul, kandeî (Pb.) Tinain, diddani (Afg.).

Habitat:—West Himalayas, Temperate Zone, Simla, Kumaon and Garwhal.

Low shrubs, with basifixed hairs. Main stems not produced ; branchlets, with densely crowded nodes. Tufts densely congested, armed with the very crowded leaf-rachises which are $1\frac{1}{2}$ -3 in. long. Stipules $\frac{1}{4}$ in., lanceolate, adnate only at the very base ; leaflets 21-31 mostly crowded, obovate oblong, $\frac{1}{2}$ - $\frac{1}{3}$ in. long ; thick in texture, dull green, clothed with silky hairs. Pedicels $\frac{1}{2}$ - $\frac{1}{3}$ in. ; bracts linear, exceeding the pedicels. Flowers 1-2 together in leaf axils, usually not peduncled. Calyx gibbous, $\frac{3}{8}$ in., thinly silky ; teeth linear setaceous, half as long as the tube. Corolla $\frac{3}{4}$ in., yellow ; standard exceeding wings and keel ; stigma naked. Pods sessile, oblong, turgid, bilocular, 12-14-seeded, clothed with fine grey silky hairs.

Use:—The seeds are given for colic, and also for leprosy (Stewart).

366. *Taverniera nummularia*, D.C., H. F. B. I., II. 140.

Vern.:—Jetimad (Sindhi, Bombay.).

Habitat:—Plains of Sind and the Punjab ; Deccan.

A copiously-branched under-shrub, 1-2 ft. high, with slender, finely canescent, terete branches. Leaves shortly petioled, usually 3-foliate. Leaflets very variable in size, $\frac{1}{4}$ -1 in. long, obovate-oblong or nearly round, thick, pale green, thinly canescent beneath, the side ones not opposite. Stipules free, minute, lanceolate, scariose. Racemes few or many-flowered, usually exceeding the leaves. Calyx $\frac{1}{8}$ - $\frac{1}{6}$ in., thinly silky. Corolla red, glabrous, $\frac{3}{8}$ - $\frac{1}{2}$ in. Joints of pod 1-4, roundish.

Use:—The leaves of this plant are said to be useful in the form of a poultice, as an application to sloughing ulcers to keep them clean (Murray 123).

367. *Alhagi maurorum*, Desv. H.F.B.I., II. 145.

Syn.:—A mannifera, Desv, Hedysarum *Alhagi* Linn., Roxb. 574.

Habitat:—Plains of the U. Provinces, upper Ganges and the Concan.

Sans.:—Durlabha, girikarnika, yavása.

Arab.:—Alhaju, haj, aâqúl, shoukuljaimal.

Pers.:—Shutarkhor, khareshutar.

Vern.:—Jawásá (H. and Bomb.); Dulalabhá (B.); Girikarmika (Tel.); Oosturkhar, kas-khandero (Sind).

The Manna, *Taranjabin*.

A low shrub, armed with copious sub-patent, hard pungent spines $\frac{1}{2}$ -lin. long. Leaves simple, drooping from the base of the spines or branches, oblong, obtuse, rigidly coriaceous glabrous. Flowers 1-6 from a spine, on short pedicels. Calyx glabrous $\frac{1}{2}$ - $\frac{1}{3}$ in. Corolla reddish, 3 times the Calyx. Pod one in. long or less, falcate or straight.

Duthie writes (*Flora of the Upper Gangetic Plain, Vol. I., p. 280*) that "the true *A. maurorum* of Tournefort, with silky pods, does not occur in India."

Uses:—The plant is described by Sanskrit writers as laxative, diuretic and expectorant, the thorny flower, stalks and branches being the parts used. No reference is made by them to the manna.

In Mahomedan works it is considered to be aperient, attenuant and alexipharmic. A poultice or fumigation with it is recommended to cure piles. The expressed juice is applied to opacities of the cornea, and is directed to be snuffed up the nose as a remedy for megrim. An oil is prepared with the leaves as an external application in rheumatism; the flowers are applied to remove piles (Dymock).

The manna is not produced by the Indian plant, but is imported from Persia and Bokhara. It is described by the author of the *Makhzan* as aperient and cholagogue, more digestible than ash manna, expectorant, a good purifier of the blood from corrupt and adust humors when given in diet drinks, such as barley water, &c; diuretic, and, with milk, fattening and aphrodisiac. (Dymock).

In the Concan, the plant is smoked along with black datura, tobacco, and ajwān seeds as a remedy for asthma (Dymock).

The infusion has a diaphoretic action (Surg. Barren, in Watt's Dictionary).

368. *Uraria picta*, Desv. H.F.B.I., II. 155.

Syn.:—*Doodia picta*, Roxb. 582.

Vern.:—Dâbrâ (H.); Sankar-jata (B.); Deterdâne (Pb.); Prisniparni (Mar.); Pitavan, pitvan (Guz.).

Habitat:—From the Himalayas throughout India.

An erect, little-branched, suffruticose perennial, 3-6ft. high. Stems robust, finely, downy. Petiole 1-2in. Leaves stipulate; upper leaves 5-9-foliate. Leaflets 4-6, rarely 9, rigidly subcoriaceous, glabrous above, reticulato-venulose, minutely pubescent below, 4-8in. long, $\frac{1}{4}$ -1in. broad; lowest simple, round or oblong. Flowers in dense cylindrical racemes, $\frac{1}{3}$ -1ft. long, $\frac{5}{8}$ - $\frac{3}{4}$ in. broad. Bracts brown, scariose, deciduous, not distinctly ciliated; upper lanceolate, lower acuminate, ovate; pedicels $\frac{1}{4}$ - $\frac{3}{8}$ in., abruptly recurved at the tip after flowering. Corolla purple, slightly exserted. Joints 3-6, glabrescent, polished, often whitish.

Use:—In Bombay, the plant is supposed to be an antidote to the poison of the phûrsa snake (*Echis Carinata*) (Dymock).

The fruit is applied to the sore mouths of children (Stewart).

369. *U. lagopoides*, D.C., H.F.B.I., II. 156.

Syn.:—*Doodia lagopodioides*, Roxb. 581

Sans.:—Prisniparni.

Vern.:—Pitvan (H.); Chakulia (B.); Dowlâ. (Bomb); Kolaponna (Tel.).

Habitat:—Tropical Zone, Nepal and Bengal.

A suffruticose perennial. Stems densely caespitose, woody, slender, pubescent, trailing. Petiole $\frac{1}{2}$ -1in. Leaves 1-and 3-foliate, intermixed. Leaflets many, of both kinds, obtuse, rounded at the base, 1-2in. long, glabrous above, finely downy

below, orbicular or oblong. Heads of flowers short, dense, oblong-cylindrical, always simple, 1-2, rarely 3-in. : long, under lin. thick ; bracts sub-persistent, distinctly ciliated. Pedicels densely crinate, not longer than Calyx. Calyx $\frac{1}{2}$ - $\frac{3}{4}$ in. ; lower teeth setaceous, densely plumose. Corolla scarcely exserted. Joints 1-2, brown polished, finely pubescent.

Use :—This plant is an ingredient of the *Dashamūla Kādhā* (Decoction). and is thus much used in Native medicine. It is considered alterative, tonic, and anti-catarrhal, but is seldom used alone (Dutt).

According to *Sushruta*, it was given with milk to women in the seventh month of their pregnancy to produce abortion.

The properties attributed to it are probably entirely fanciful (Pharm. Ind.)

370. *Alysicarpus longifolius*, W. & A., H.F.B.I., II. 159.

Habitat :—Plains, scattered throughout India proper.

Stems stout, ascending, sub-glabrous, reaching 4-5 ft. Leaflets oblong and lanceolate, 3-6 in. long, the flowers adpressed to the finely hairy rachis ; pedicels $\frac{1}{2}$ in. Calyx $\frac{1}{4}$ in. ; teeth lanceolate, 4-5 times the length of the funnel-shaped plicate tube. Pod 4-6-jointed, usually exserted, $\frac{1}{2}$ in. broad, turgid moniliform, marked with only a few faint raised vines.

Use :—The roots are sweet like liquorice and are called liquorice by the Indian peasants, and used as a substitute for the same.

371. *Arachis hypogæa*, Linn, H.F.B.I., II. 161, Roxb. 252.

Vern. :—Mung-phali ; vilāyeti-mung (H.) ; Māt-kalai ; chini-bādām ; bilati-mung (B.) ; Bhui-mung ; (Sind.) ; Bhui-shing (Bom.) ; Bhui-mug ; bhui-chane (Mar.) ; Chini-mung ; bhui-CHANĀ (Guz.) ; Ver-kadalai ; nila-kadalai ; kadalaikai ; manilla-kottai (Tam.) ; Veru-sanagalu ; manilla-ginjalū ; nila-sanagalu (Tel.) ; Bhui-mug. (Kan).

Habitat :—Cultivated in many parts of India.

A diffuse annual herb. Root annual. Stems or rather branches, many, diffuse, hairy, from 2-4 ft. long. Leaves alternate, pinnate. Leaflets 2 pairs, oval and obovate, slightly hairy underneath. Petioles longer than the leaflets, with the base enlarged into a stem-clasping sheath with two ensiform processes. Flowers axillary, two or three together blossoming in succession. Bracts a common exterior pair to the fascicle and small proper ones to the several flowers. All are membranaceous tapering to a fine point and ciliate. Calyx with a very long, filiform, slender tube; mouths two-parted; the upper lip three-cleft, with the middle division emarginate; the lower lip lanceolate, and rather longer. Corolla papilionaceous resupinate of a bright yellow colour. Vexillum round, emarginate, large in proportion to the other petals inserted with the wings and carina partly on the base of stamiferous tube and partly on the mouth of the tube of the Calyx, wings free obliquely ovate, concave, longer than the carina which is at base two-parted; the upper half in curved and subulate; Filaments ten united into one fleshy tube with a groove, but opening on upper side. Anthers alternately sagittate and ovate. Germ (ovary) ovate, lodged on the base of the sessile tube of the Calyx. Style long and slender. Stigma even with the anthers, and bearded on the inside. Legume oblong leathery, swelled at each seed, reticulated with prominent nerves, one-celled not opening spontaneously, nor are the sutures very conspicuous; length various but in general about as thick as the little finger. Seeds from one to four, ovate, smooth, of the size of a French bean. The manner in which the young minute germ (ovary) of the plant acquires pedicels, sufficiently long to allow it to thrust itself into the ground to the depth of one, two or even three inches where it grows and ripens its seed is truly wonderful. Roxburgh further observes: "to understand the admirable economy it must be observed that the flowers are most perfectly sessile, two, three or four in the axils of ten leaves, and that the germ is lodged in the very base of the tube of the Calyx. Soon after the flower decays the germ acquires pedicels, after which it lengthens fast, it then enters the earth, and when the legume is perfectly formed, it will generally be found as deep in the earth

as when full grown, I therefore conceive that it buries itself to its greatest depth before seeds begin to enlarge, and while the germ is only on obtuse point."

Found all over the warm parts of Asia, In the Dekkan and Concan.

Parts used :—The nut and oil.

Uses :—The oil may take the place of olive oil. "In Bombay the oil is expressed at the Government Medical Store Depôt for pharmaceutical purposes, to the extent of about 6,000 lbs. annually. It is used as a substitute for olive oil" (DYMCK).

"The experiments of Winter in the United States is that it is well adapted for the preparation of cerates and ointments, but that it would not serve as a substitute for olive oil in the preparation of lead plaster. Falicres found it to possess great aptitude for the nitric solidification, hence he has recommended its use in the preparation of *Unguentum Hydrargyri Nitratis*" (Bentley and Trimen). "The unripe nuts are sweet and are given to women whose supply of milk is insufficient for their children; the unripe nuts are less oily and, therefore, more easily digested" (SUBBA RAO).

Leather has shown that the Mauritius variety of ground-nut contains from 44 to 49 per cent. of oil, while the indigenous varieties contain only 40 to 44 per cent. Newer samples have more recently been imported and it has been noticed that they are uniformly more rich in oil than the local kinds. These figures refer to the proportion of oil in the kernels. The proportion by weight of unhusked nuts to kernels is as 4 to 3. The bulk of the Indian manufacture of the oil is in the hands of owners of native rotary mills. Mills of the European pattern have been tried in South India, but they could not compete with the crude native mills as the cake from the former was too dry and powdery. Recently mills have been opened in Calcutta and elsewhere in Bengal for the manufacture of the oil and have created a large import traffic in the nuts. The nuts having been shelled the expression is carried out in two stages. The first expression is carried out at the ordinary temperature, and the cold drawn oil is nearly colourless, has a pleasant taste and is used as a salad oil. The second expression is made at a temperature of 30° to 32° and yields an oil suitable for edible purposes and for burning. Sometime a third expression is made at a higher temperature and gives a turbid oil suitable for soap making. Arachis cake contains the highest amount of proteins of all known oil-cakes. That from non-decorticated nuts contains 5.35 per cent. of nitrogen and 0.9 per cent. of phosphoric acid, and that from the kernels contains 7.9 per cent. of nitrogen and 1.35 per cent. of phosphoric acid.

Arachis oil has the following constants: Specific gravity at 15°, 0.917 to 0.920; solidifying point, about zero; saponification value, 185.6 to 194.8; iodine value, 83.3 to 100; Reichert-Meissl value, 0.0; Maumene test, 49°. Insoluble fatty acids and unsaponifiable, 94.87 to 95.86; melting point, 22° to 29°; iodine value, 95.5 to 103.42; mean molecular weight, 281.8.

Arachis oil can be identified and detected by the isolation of arachidic acid, a constituent melting at 74.5°. About 10 grms. of the oil is saponified, neutralised and treated with lead acetate. The lead salt is extracted with ether and the insoluble portion is decomposed and the fatty acids dissolved in 50 c.c. of 90 per cent. hot alcohol. On cooling the alcoholic solution, a crop of crystals will be obtained which should amount to 5 per cent. of the oil and melting between 74° and 75.5°. (*Agricultural Ledger*, 1911-12—No. 5, pp: 137-138.)

372. *Ougeinia dalbergioides*, Benth, H.F.B.I., II. 161.

Syn.:—*Dalbergia ougeinensis*, Roxb. 532.

Sans.:—*Tinisa sejanduna*.

Vern.:—Sândan, asainda, tinnas, timsa (Hind.); Tinis (Beng.); Bandhona (Uriya); Ruta (Kol.); Rot (Santal); Sandan-pipli (Nepal); Tewsa (Bhil.); Sêr, shermana, tinsai (Gond.); Rutok (Kurku); Shânjan, pânan, tinsa, sâldan (N.-W. P.); Telus, sannan, sândan (Pb.); Tunnia, (Banswara); Tinsa, karimattal, kala phalas tinnas, (C. P.); Tiwas, tunus, tunnina, telas, sandan, timsa (Bomb.); Kâlâ palas, tewas, tiwas, tanach (Mar.); Dargu, tella motuku, nemmi chettu, manda motuku (Tel.); Kari mutal, (Kan.)

Habitat:—Sub-Himalayan tract from the Sutlej to the Tista; also Central India and the West Coast.

A moderate-sized, deciduous tree 20-40 ft., sometimes gregarious, with a short and often irregularly-shaped trunk. Bark $\frac{1}{2}$ in. thick, light brown, sometimes with bluish patches, with regular longitudinal and horizontal cracks. Wood hard, close-grained; sap-wood small, grey; heart-wood mottled, light brown, sometimes reddish-brown. Leaves pinnately 3-foliate, distinctly petioled, stipellate. Leaflets coriaceous, unequal, the terminal largest, broad-oval, the lateral opposite, oblique, edges undulate or slightly crenate, 3-6 in. long. Flowers very copious, white or pale pink, on long slender pedicels, in dense fascicles or on short racemes, forming loose heads on old wood,

1-2in. across. Pedicels $\frac{1}{2}$ - $\frac{3}{4}$ in., filiform, downy or glabrous. Calyx $\frac{1}{8}$ - $\frac{1}{2}$ in.; teeth obtuse. Stamens diadelphous; anthers uniform. Pod oblong-linear, 2-3in. long, flat-veined, slightly contracted between the seeds, scarcely dehiscent; seeds 2-5, flat.

Uses:—The bark when incised furnishes a kino-like exudation, which is used in cases of dysentery and diarrhœa (Lisboa). But its efficacy is very doubtful (K. R. K.). According to Campbell (Econ. Prod., Chutia Nagpur), a decoction of the bark is given among the hill tribes, when the urine is high coloured. In the Central Provinces, the bark is said to be used as a febrifuge.

373. *Desmodium tiliaefolium*, G. Don. H.F.B.I., II. 168.

Vern.:—Motha, sambar, shamru, chamra (H.); Chamyâr marâra, gur-kats, dud-sambar, pirhi (Pb.).

Arab.:—Sad-koofi.

Pers.:—Mushk-Zamin.

Habitat:—Himalayas, from the Indus to Nepal.

A small, erect, shrubby plant; branches slender, terete, finely downy. Leaves 3-foliate. Leaflets obtuse or sub-acute, thick, flexible, sub-coriaceous, green, glabrescent above, densely hoary beneath; end one obovate, 2-3in. long, entire or obscurely repand, base deltoid or rather rounded. Petiole 2-3 in. Racemes copiously lax, often 1ft. long, axillary and terminal, the latter often copiously paniced with lower branches again compound. Bracts lanceolate. Pedicels $\frac{1}{4}$ - $\frac{3}{8}$ in., ascending, finely downy. Calyx $\frac{1}{8}$ in., downy; teeth deltoid, shorter than the tube. Corolla $\frac{3}{8}$ - $\frac{1}{2}$ in. Pod 2-3 in. long, $\frac{1}{4}$ in. broad; joints 6-9, longer than broad, thinly clothed with adpressed silky hairs.

Use:—The roots are considered carminative, tonic and diuretic, and used in bilious complaints. (Dr. Emerson.)

374. *D. gangeticum*, D.C., H.F.B.I., II. 168.

Syn.:—Hedysarum gangeticum, Linn., Roxb. 575.

Sans.:—Sâlaparni.

Vern.:—Sarivan (H.); Sâlpâni (B.); Sâlwani, dâye (Bomb.); Tandi-bhedi-janetet (Santal), Gita-naram, kolaku-ponna (Tel.).

Habitat :—From the Himalayas throughout India.

A slender under-shrub. Stem 2-3ft. high, suberect, woody, slightly angular, clothed with short grey down upwards. Leaves imparipinnate; petiole $\frac{3}{4}$ -1 $\frac{1}{8}$ in. Leaflets oblong, ovate to narrow-lanceolate, membranous, 3-6in. long, acuminate glabrous above, more or less pubescent beneath. Secondary nerves 8-10 pair. Racemes slender 6-12in. long, axillary, mostly terminal, pedicels ascending. Flowers white, $\frac{1}{10}$ in. long, jointed; $\frac{1}{2}$ - $\frac{2}{3}$ by $\frac{1}{16}$ in. Calyx under $\frac{1}{12}$ in., finely downy, teeth lanceolate. Corolla $\frac{1}{8}$ - $\frac{1}{10}$ in. Pod falcate, 6-8-jointed, $\frac{1}{2}$ - $\frac{3}{4}$ by $\frac{1}{10}$ in., glabrescent or clothed with minute hooked hairs.

Use :—By Hindu writers it is regarded as a febrifuge and anti-catarthal. It forms an ingredient of the Dasamula Kwatha or decoction of ten herbals; this decoction is used in remittent fever, puerperal fever, inflammatory affections within the chest, affections of the brain, and many other diseases supposed to be caused by the derangement of all the humors (Dutt).

375. *D. polycarpum*, D.C., H.F.B.I., II. 171.

Syn. :—Hedysarum purpureum, Roxb., 578.

Vern. :—Bæphol (Santal.).

Habitat :—Himalayas, and everywhere in the plains.

An erect or sub-erect undershrub, with woody, slightly angular, slender branches, clothed upwards, with short adpressed grey hairs. Petiole $\frac{1}{2}$ -1 in. Leaves imparipinnate. Leaflets subcoriaceous, green, glabrous above, thinly clothed, with adpressed grey hairs beneath; end one obovate-oblong, obtuse, 1-3in. long; side ones smaller. Racemes terminal and lateral, close, short-peduncled, 1-3in. long, the end one sometimes branched; bracts $\frac{1}{8}$ - $\frac{1}{10}$ in.; pedicels $\frac{1}{8}$ - $\frac{1}{10}$ in.; glabrous. Calyx $\frac{1}{4}$ in.; teeth acuminate, exceeding tube. Corolla under $\frac{1}{4}$ in. Pod $\frac{1}{2}$ - $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. broad, glabrescent or minutely downy, 5-8-jointed (J. G. BAKER).

Use :—The Santals use a preparation of this plant in fainting and convulsions (Revd. A. Campbell).

376. *D. triflorum*, D.C., H.F.B.I., II. 173.

Syn. :—Hedysarum triflorum, Linn., Roxb. 577.

Vern.:—Kudaliya (M. & B.); Moonoodda-moddoo (Tel.); Jangli or Rân methi (Bombay).

Habitat:—Everywhere in the plains, throughout India; Kumaon and Kashmir.

Trailing herbs, $\frac{1}{2}$ -1 $\frac{1}{2}$ ft., stems caespitose, very slender, copiously branched, clothed with fine spreading hairs. Leaves 3-foliate. Stipules lanceolate, persistent; petioles $\frac{1}{8}$ - $\frac{1}{4}$ in.; leaflets obovate, $\frac{1}{8}$ - $\frac{1}{2}$ in., truncate or emarginate, with a few adpressed hairs below. Flowers 1-3 together, without a common peduncle in the axils of the leaves. Bracts deciduous. Pedicels $\frac{1}{4}$ - $\frac{3}{8}$ in. Calyx pubescent, $\frac{1}{12}$ - $\frac{1}{8}$ in.; teeth very long, setaceous. Pod $\frac{3}{8}$ - $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. broad, 3-5-jointed distinctly, pubescent; upper suture straight, lower slightly indented.

Use:—The fresh leaves are applied to wounds and abscesses that do not heal well (Wight).

A paste of the bruised leaves with kamala is applied to indolent sores and itch. In the mofussil, the fresh juice of the plant is given to children for coughs (S. Arjun). In Ceylon, it is used in dysentery (Watt).

377. *Abrus precatorius*, Linn., H.F.B.I., II. 175, Roxb. 544.

Sans.:—Gunja.

Vern.:—Rati (H.); Kunch (B.); gumchi (Guz.); Maspat (Nepal); Kawet (Santal.); Latuwani (Ass.); Gundumani (Tam.); Ghurie-ghenzâ (Tel.).

Habitat:—From the Himalayas, throughout India.

A perennial twiner. Stems numerous, scarcely woody, slender, glabrous, with long internodes. Leaves spreading, pinnate, rachis 2-4 in., thickened at base, very slender, channelled, very glabrous. Stipules minute, setaceous. Leaflets 20-24 (10-20 pair) or more, opposite, very shortly stalked, quickly deciduous, about $\frac{3}{4}$ in., oblong, obtuse at both ends, minutely apiculate, glabrous above, slightly hairy beneath, thin; flowers pale violet, rather small, shortly stalked, several together on very short, swollen, knob-like branches, crowded at ends of

short, curved, swollen peduncles, usually shorter than the leaves. Calyx glabrous or very likely silky. Pod $1\frac{1}{4}$ - $1\frac{1}{2}$ by $\frac{1}{2}$ in. wide, flat, oblong, truncate, with a sharp deflected beak, finely silky. Seeds 3-5, rather over $\frac{1}{4}$ in. ovoid, usually bright scarlet, with a black patch on top, highly polished as if covered with red lac.

The flowers are sometimes white, when the seeds are of that colour, with the black on top; sometimes the seeds are mixed black and white (J. G. BAKER).

Parts used :—The roots, seeds, and leaves.

Uses :—The watery extract of the root is useful in relieving obstinate coughs (K. L. Dey).

Formerly, the root was considered to be a perfect substitute for liquorice, but experience has shewn this to be erroneous.

By Sanskrit writers the root is described as emetic and useful in poisoning. Internally, the seeds are described as poisonous and useful in affections of the nervous system, and, externally, in skin diseases, ulcers, affections of the hair, &c. The seeds reduced to a paste are recommended to be applied locally in sciatica, stiffness of the shoulder joint, paralysis, and other nervous diseases. In white leprosy, a paste composed of the seed and plumbago root is applied as a stimulant dressing. In alopecia a paste of the seed is recommended to be rubbed on the bare scalp (U. C. Dutt).

The seeds are used as a purgative, but in large doses are an acrid poison, giving rise to symptoms resembling those of cholera. The poisonous property is generally believed to be in the red covering of the seed (Surg.-Major Jayakar).

When boiled with milk the seed is said to have a very powerful tonic action on the nervous system (Barren).

Taken internally by women, the seed disturbs the uterine functions and prevents conception. For the latter purpose, 4 to 6 seeds are swallowed every day, in 2 doses, for several days, after each menstruation.

I am aware of one successful case under this treatment (Moodeen Sheriff).

The powdered seeds are taken as snuff in cases of violent headache arising from cold (Mr. Mukerji).

The boiled seeds are said to possess powerful aphrodisiac properties (Surg.-Major Houston).

The seeds reduced to a paste are used for contusions and to reduce inflammation.

If the leaves are steeped in warm mustard-oil and applied over the seat of pain in rheumatism much benefit will be derived (Surgeon-Major W. Wilson).

The juice of the fresh leaves, mixed with some bland oil, and applied externally, seems to relieve local pain (Surg.-Major B. Gupta).

Abrin, which has been subjected to tryptic digestion and the proteids salted out, gives no biuret reaction; its poisonous characters remain unaltered, and it agglutinates red blood corpuscles as intensely as the unaltered abrin which contains proteids. Abrin, whether united to proteids or not, gives a precipitate with antiabrin blood serum. Abrin corresponds on the whole with ricin, but differs from it, in that its agglutinating properties are resistant to pepsin—hydrochloric acid, even more resistant than its poisonous action.

J. Ch. S. 1902, A I. 408.

378. *Cicer arietinum*, Linn., H.F.B.I., II. 176, Roxb. 566.

Vern:—Chanâ, bût (H.); Chhola (B.); Chana, harbharâ (Bomb.); Kadalai (Tam.); Senagaloo (Tel.); Kadala (Malay).

The vinegar—Chanakâmla (Sans.); Chane-ka-sirkah (H.); Chana-amba (Bomb.); Kadalai-kâdi (Tam.)

Habitat:—Commonly cultivated in the Northern Provinces and Nilghiris.

An annual herb, viscose, much-branched. Leaves pinnate, rigid, 1-2 in., with usually a terminal leaflet. Leaflets close, oblanceolate or oblong. Stipules small, with a few long teeth. Corolla scarcely half as long again as the Calyx. Flowers in axils of the leaves; peduncle $\frac{1}{2}$ - $\frac{3}{4}$ in. Calyx $\frac{1}{4}$ - $\frac{1}{2}$, teeth linear, 2-3 times the tube. Pubescence of pod short and fine. Pod oblong, $\frac{3}{4}$ -1 in., turgid, narrowed into the persistent style. Seed solitary generally; exceptionally double one upon the other, without septal division.

Commonly cultivated in the Northern Provinces and Nilgiris. The best gram comes to Bombay from Gujrat—Jambusar.

Use :—The vinegar is mentioned by the Sanskrit writers as a useful astringent which might with advantage be given in dyspepsia.

According to Dr. Walker) Bomb. Med. Phys. Trans. 1840, p. 67), the fresh plant put into hot water is used by the Portuguese in the Deccan, in the treatment of dysmenorrhœa; the patient sits over the steam (Dymock).

Chick peas are extensively used in southern Bulgaria in the form of 'Leblebiji' prepared by roasting them in a special way for a long time at 105-115°. Another preparation called 'Ssimitt' is made by fermenting a mass obtained by soaking the coarsely ground peas for 8-15 hours in water at 32-35°. The fermentation produces H, H₂S, CO₂, butyric, lactic, and succinic acids, sugar, EtOH and its higher homologs, leucine, asparagine, etc., phenol, and aromatic substances. Analysis of 24 samples of chick peas before roasting showed: moisture 9.20-13.0%, protein 19.10-27.05%, fat 4.6-6.10%, starch 44.89-52.80%, ash 2.36-4.30%, crude fibre 2.40-4.60%, lecithin P₂O₅ (10 samples) 0.102-0.136%, and total P₂O₅ (11 samples) 0.784-0.902%.

After roasting (leblebiji), the analysis was as follows: moisture 4.90-7.20%, protein 23.80-26.10%, fat 5.20-7.00%, ash 2.00-3.43%, crude fibre 1.62-3.15%, lecithin P₂O₅ (10 samples) 0.133-0.161%, and total P₂O₅ (11 samples) 0.964-0.992%.

An analysis of chick pea fat gave the following consts.: d₁₅ 0.9369-0.9376, solidification pt.—19.50, n₂₅ 73.5-74, sapon. No. 240, acid No. 0.3-0.5, ester No. 239.5, R-M. No. 4.51, Polenske No 1.1, Hehver No. 91.6, I No. 110-119, unsapon. 0.43, m. p. fatty acids 250, I no. fatty acids 129. The sprouting peas contain oxidase, Tymase, protease, diastase, and a form of reunin.

[Chemical Abstracts, Jan. 20, 1914, pp. 384-5.]

379. *Lathyrus sativus*, Linn., H.F.B.I., II. 179, Roxb. 567.

Sans. :—Triputi.

Vern. :—Kesari (H.); Teora (B.); Mattar (Sind.); Lâkh (Mar.); Lâng (Guz.).

Habitat :—Spread throughout the Northern Provinces, from the plains of Bengal to Hazara, Kashmir and Kumaon.

An annual herb, with winged stems, glabrous, much branched, with equally pinnate leaves, ending in a tendril; leaflets 2, linear or lanceolate, stipules broad, entire. Petiole winged, terminated by a long tendril. Flowers solitary;

peduncle rather longer than the petiole. Calyx $\frac{3}{8}$ - $\frac{1}{2}$ in.; teeth lanceolate, sub-equal, twice the tube. Corolla $\frac{3}{4}$ in., red, bluish or white. Pod $1\frac{1}{2}$ in. long, oblong, winged on the back, glabrous, 4-5-seeded.

Uses.—The expressed oil of the seed is powerful and a dangerous cathartic (O'Shaughnessy).

It has long been known to produce toxic symptoms when used for a prolonged period. This condition, known as lathy-rismus, has been investigated by Dr B. Suchard. The chief effect produced is upon the muscles of the lower extremities, especially on those below the knee. In horses also paralysis of the hinder extremities takes place, and death has followed from bilateral paralysis of the laryngeal recurrent nerves and consequent asphyxia. The laryngeal affection has not, however, been observed in the human subject (*Lancet*, June 30th, 1888, p. 6312).

380. *Glycine Soja*, Sieb and Zucc, H.F.B.I., II. 184.

Syn.:—*Dolichos Soja*, Linn., Roxb. 563.

Vern.:—Gari-kulay (B.); Bhat, bhatwan (H.); Hendedisom horec (black-seeded), puddisomhorec (white-seeded variety) (Santal); Tzu-dza (Naga); Seta, kala-botmas (Parbat); Musa, gya (Newar); Khajuwa (Eastern Terai); Bhut (Kumaon).

Eng.—The Soya Bean.

Habitat.—Tropical Himalayas, from Kumaon to Sikkim Khasia and the Naga hills.

An annual, stout, suberect, climbing upwards, stem densely clothed with fine ferruginous hairs. Leaves long-petioled. Leaflets 3 membranous, ovate, acute, rarely obtuse, 2-4 inches long. Racemes few-flowered, congested, sessile. Calyx $\frac{1}{4}$ in, densely hairy. Calyx-teeth long, setaceous. Corolla reddish, little exerted. Pods usually only 2-3, developed in the axil of each leaf, linear-oblong, recurved, densely pubescent, $1\frac{1}{2}$ -2 in by $\frac{1}{2}$ - $\frac{3}{8}$ in., 3-4 seeded, subtorulose.

Use.—A decoction of the root is said to possess astringent properties (Watt).

Soya bean oil contains 94-95 p. c. of fatty acids (present as glycerol esters) of which about 15 per cent. consist of saturated acids (palmitic acid) and about 80 per cent. of liquid unsaturated fatty acids. The latter were found to consist of about 70 per cent. of oleic acid, about 24 per cent. of linolic acid and about 6 per cent. of linolenic acid. Samples of the oils labelled "purified" and "unpurified" had the following characters respectively:—Sp. gr. at 15°C., 0.9260, 0.9265; solidif. pt.—11.5°C., —12°C.; refractive index at 40°C., 1.4630, 1.4680; acid value, 5.7, 1.71; saponification value, 192.3, 194.3; iodine value (Hübl, after 18 hours' action), 131.3, 132.67; Reichert-Meisel value, 0.75, 0.75; Polenske value, 0.78, 1.08; elaidin reaction, positive. Exposure of the oil for six months (in daylight) to moist air increased the acid value, but lowered the iodine value. Pure oxygen both in the absence and presence of moisture, had no influence on the iodine value.

The phyto sterol of Soya beans. The unsaponifiable portion of Soya bean oil amounts to about 0.7 per cent., which is easily separated into a crystalline portion (about 55 per cent.) and a liquid portion (about 45 per cent.) by means of petroleum ether (b. p. 50° C.) in which the latter is soluble. The crystalline portion consists of two substances (a) about 2.4 per cent. of a phytosterol, melting at 160°C., which has two double linkages and is strongly laevorotatory. It is identical with the stigmasterol isolated from Calaban beans by Windans and Hauth; (b) about 97 per cent. of a laevorotatory phytosterol with one double linkage and melting at 139°C. The liquid portion of the unsaponifiable portion of Soya bean oil consists of unsaturated oxygenated compounds, which give the phytosterol reaction. Elementary analysis gave the same proportion of carbon and hydrogen as in the case of phytosterol (b). Experiments made to separate the phytosterol-like constituent of the liquid portion by Windans' method with digitonin were unsuccessful.

(J. Ch. I, September 30, 1911, p. 1124).

381. *Teramnus labialis*, Spreng, H.F.B.I., II. 184.

Syn. :—*Glycine labialis*, Linn., Roxb. 565.

Sansk. :—Mâshaparni (fresh-leaved), krishna-vrintâ (black-stalked), Kamboji (a shell), Haya puchhika (horse-tailed), Mansa masha (flesh weighing 2 tolas), Sinha-mukhi, (lion-mouthed), Swada masha (having sweet flesh), Maha-saha (having great power).

Vern.—Mashoni (H.); Mashani (B.).

Habitat.—Plains, from the foot of the West Himalayas to Ceylon.

Habitat :—Plains from the foot of the West Himalayas to Ceylon, Burma and Penang. Cosmopolitan in the tropics. Natal.

A twining herb. Stems wide-climbing, slender, with a few adpressed hairs. Stipules minute; lanceolate, deciduous; petiole $\frac{1}{2}$ -1 $\frac{1}{2}$ in. Leaflets 3, membranous or subcoriaceous, small acute or subobtusate, green, with a few adpressed hairs above, grey and more hairy below, the end one ovate or oblong, 1-2in. long. Racemes 1-4in. lax, usually long, usually peduncled, elongated, the pedicel fascicled. Calyx $\frac{1}{8}$ - $\frac{1}{4}$ in.; teeth lanceolate, as long as the tube. Corolla reddish. Pod linear, glabrous, recurved, 1 $\frac{1}{2}$ -2in. long, 8-10 seeded.

Use.—It is used in Hindu Medicine. Its properties are described in the *Nighantu* as follows:—

The Mashparni is bitter, cooling, sweet, astringent, and dry. It produces semen, strength, and blood. It cures consumption and fever and disorders of wind, bile and blood.

382. *Mucuna monosperma*, D.C., H.F.B.I., II. 185.

Syn.—Carpopogon monospermum, Roxb. 553.

M. anguina, Wall.

Vern.—Sougarvi, mothi-kuhili (Bomb.); Pedda, enooga, doola-gunda (Tel.).

Habitat.—East Himalayas, tropical zone, Khasia, Assam, Chittagong and the hills of the West Peninsula.

A large, woody climber, the young branches clothed with rufous, deciduous tomentum. Leaves large, rachis 2 $\frac{1}{2}$ -4 $\frac{1}{2}$ in., with red, deciduous pubescence. Stipules deciduous. Leaflets on short swollen stalks, 2-4, rotundate or broadly oval, shortly acuminate, smooth above, more or less closely pubescent beneath, lateral ones unequal-sided. Flowers large, 1 $\frac{3}{4}$ in., bright violet, keel green, on divaricate pedicels, $\frac{1}{2}$ in. long, 6-10in., a lax pubescent raceme (or panicle), shorter than leaves. Calyx sparingly clothed with red bristles; upper segments wanting; standard often with a few bristles on back. Pod 2in.; broadly ovate-ovoid, shortly-stalked, somewhat curved, with a short decurved beak, with a broad double horizontal wing along both sutures and several (about 6) broad, erect, distinct wings extending from them at right angles nearly half

way down the sides, the whole covered with orange-red, deciduous wool mingled with irritant red bristles. Seeds solitary, nearly circular, compressed, dark brown, hilum linear, extending round $\frac{3}{4}$ of the edge.

Part used.—The seed.

Use:—The seed used as an expectorant in cough and asthma, and is applied externally as a sedative (Peters).

383. *M. gigantea*, D.C., H.F.B.I., II. 186.

Syn. :—Carpopogon giganteum, Roxb. 554.

Vern. :—Kaku-valli (Mal.)

Habitat.—Plains of the West Peninsula, Ceylon, Malaya.

A large, woody climber, with slender, glabrous branches. Stem thin, but sometimes 250ft. long. Leaflets ovate, acute, glabrous when mature; flowers on long slender pedicels, almost umbellate at end of long peduncles. Pod 4-6in., apiculate, with broad double wings along both sutures, but without wings or plates on the sides, densely covered with adpressed, chestnut-brown, irritant bristles.

Uses.—Used in rheumatic complaints. The bark for this purpose is pulverized, mixed with dry ginger, and rubbed over the parts affected (Rheede).

384. *M. pruriens*, D.C., H.F.B.I., II. 187.

Sans. :—Atmagupta, kapikachhu, vanari.

Vern. :—Kiwach, goucha (H.); Alkusa (B.) Konatch (Nepal.); Kâch-kuri (Dec.); Kuhili (Bomb.); Kavach (Mar.); Kivâñch (Guz.); Punaik-kali (Tam.); Pilliaduga (Tel.); Nâyik-korana (Mal.); Nasaguni-gida (Kan.)

Habitat :—Cosmopolitan in the Tropics, from the Himalayas in the plains to Ceylon and Burma. Western Peninsula, Assam, Khasi Hills.

A semi-woody climber, annual or perennial, with slender terete branches, usually clothed with short, white, deflexed hairs. Leaves large, rachis 3-5in.; sparingly deflexed, hairy. Leaflets 3-4in., on short thick hairy stalks, terminal ones smaller and rhomboid-oval, lateral ones very unequal, with the lower half greatly dilated, all acute, mucronate, pubescent above,

densely covered with shining, silvery, adpressed hair beneath; flowers dull, dark-purple, the keel yellowish-green, numerous, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. long, on short pubescent pedicels, usually two or three together at intervals, on a slender pubescent raceme 6-12 in. long. Bracts $\frac{1}{2}$ in., lanceolate, hairy, soon falling. Calyx densely silky, 2 upper segments completely connate; lower much longest. Pod $2\frac{1}{2}$ -3 in. by about $\frac{1}{2}$ in. broad, linear, blunt, falcately curved at both ends, a longitudinal rib along whole length of each valve, but without wings, densely covered with close, rather weak, orange-brown, irritant bristles, pointing backward and readily detached; 4-6-seeded, with partitions between them. Seed ovoid, $\frac{1}{4}$ in., compressed, brownish, mottled with black, hilum oblong, not half the length of seed.

Parts used.—The seeds, root and legume.

Use.—According to Susruta, the seeds are aphrodisiac; the root is tonic and useful in nervine diseases (Dutt).

Ainslie says that a strong infusion of the root, mixed with honey, is prescribed by the Tamool doctors in cholera.

The use of the hairs of the mucuna pod as a vermifuge to expel ascarides appears to have originated in the West Indies, no mention of such an employment of them being found in Indian works (Dymock).

The pods are officinal in the Indian Pharmacopœia, to be used as an anthelmintic.

In the West Indies, a decoction of the root is reckoned a powerful diuretic and cleanser of the kidneys, and also made into an ointment for elephantiasis. Leaves are applied to ulcers. A vinous infusion of the pods is said to be a certain remedy for dropsy (Drury).

The root is prescribed as a remedy for delirium in fever in Chutia Nagpur. Powdered and made into a paste, it is applied to the body in dropsy, a piece of the root being also tied to the wrist and ankle. The seed is believed to absorb scorpion-poison when applied to the part stung (Revd. A. Campbell).

An ointment prepared with the hairs acts externally as a local stimulant and wild vesicant. (Watt.)

385. *Erythrina indica*, Linn., H.F.B.I., II. 188, Roxb 541.

Sans. :—Māṇḍāla.

Vern. :—Pāṅgra, panjira, furrud (H.); Palita mundar (B.); Muruka-marum (Tam.); Modugu, badide-chettu (Tel.); Mooloo-moorikah, dudup (Mal.); Paravalada-mara (Kan.). Birsing (Kol.); Pāṅgāra, phangra, pān. ārā (Mar.); Panarawes, pararoo (Guz).

Habitat :—From the foot of the Himalayas throughout India.

A deciduous, quick-growing tree, attaining to large size. Bark thin, smooth, grey. Outer bark, says Gamble, yellowish, smooth and shining, peeling off the thin papery flakes. "Structure like that of *E. suberosa*, Roxb.," says Gamble, further, "Inner bark, fibrous, wood very soft spongy, white, fibrous but tough." Young twigs thick set, with small straight, horizontal, broad-based, sharp, black prickles; leaf-scars conspicuous. Leaves very large, deciduous, rachis 6-12in., smooth, dilated at base, stipules none or very nearly caducous. Leaflets 4-6in., on short swollen stalks, readily disarticulating, roundish-ovate, acute, glabrous and green on both sides, the terminal one largest: stipels thick, roundish, persistent. Flowers numerous, large, generally scarlet, the wings and keel crimson; on stout puberulous, peduncles horizontally spreading. Pedicels, about $\frac{1}{2}$ in. long, arranged in 2's or 3's, and closely crowded on the upper half of very stout, rigid, puberulous racemes, 6-12in. long, 2-4 of which diverge horizontally from the summit of the branches. Calyx (before expansion of flowers) tubular, $1\frac{3}{4}$ in., covered with deciduous tomentum, upper segment subulate, sharp but not rigid, two lateral similar but smaller lowest, one longer doubled over the rest to form blunt point to the bud, soon splitting along the back (between the upper teeth) to the base, and the whole curved down like a spathe-standard, nearly 3in. Wings less than 1in. Keel-petal $\frac{3}{4}$ in. Stamens much exserted and projecting in front of flowers, $2\frac{3}{4}$ in. Pod 5-6in., cylindric, torulose, beak sharp, curved, about 1in. long. Seed, 3-8, beanlike, about 1in. long, chocolate coloured, dull, shining.

Very common in the Concan and North Kanara. I have seen a white-flowered variety, and a deep scarlet one in the Thana Forests (K. R. K.) A variety, with pink flowers, is noted by Moon, says Trimen.

Parts used :—The bark, juice and leaves.

Uses :—The bark is used medicinally as a febrifuge and antibilious (Watt).

In the Concan, the juice of the young leaves is used to kill worms in sores, and the young roots of the white-flowered variety are pounded and given with cold milk as an aphrodisiac (Dymock).

It is anthelmintic and useful as a collyrium in ophthalmia. The leaves are applied externally to disperse venereal buboes and to relieve pain of the joints (Kanai Lal Dey).

The fresh juice of the leaves is used as an injection into the ear for the relief of ear-ache, and as an anodyne in toothache (Dr. Thornton, in Watt's Dictionary).

386. *Butea frondosa*, Roxb., H.F.B.I., II. 194, Roxb. 540.

Sans. :—Palás.

Vern. :—Dhák, palás, têsû-ká-per, kakria, kankeri, chichra (H.) Palás (B.); Chalcha (Bundelkund); Mureet (Kol.); Murup (Santal); Paras, faras (Behar); Palási, bulyethra (Nepal); Lahokung (Lepcha); Porásu (Uriya); Chiula, puroha (Bom.); Palás-ká-jhár, tesu-ká-jhár (Duk.); Khákará, Khakhado, khakhar-nujhada (Guz.); Khakar, pálás (Cutch); paras, palas, phalásá-cha-jháda, kakrácha-jhada (Mar.); Porasan, parasa, murukkan, puraishu, purashu, palásham (Tam.); Moduga, mohatu, tella-modugu, móduga-chettu, paládulu (Tel.); Muttuga thorás, muttuga-mará, muttuga-gida (Kan.); Pilách-cha, muruk-ka-maram (Mal.).

Eng. :—The Forest flame.

Habitat :—Common throughout India and Burma, often gregarious. Ceylon, N. W. Himalaya.

An erect, moderate-sized, deciduous tree, reaching a height of 40-50ft., with a cracked trunk and irregular branches. Bark

$\frac{1}{2}$ in. thick, fibrous, grey, exfoliating in small irregular pieces; exuding from cut and fissures a red juice which hardens into a ruby-coloured gum similar to Kino. Wood grey or grey brown, white or brown, if cut up fresh and quickly seasoned, soft and durable (Gamble). Trunk crooked and irregular. Young shoots densely pubescent. Leaves large, rachis 5-8in., slender, pubescent when young, swollen at base. Stipules small, linear-lanceolate, deciduous. Leaflets 4-8in., unequal, the terminal the largest and rhomboidal, orbicular, the lateral ones ovate-oval, dilated in lower half, all very obtuse, glabrous above when mature, closely and finely tomentose, and with much raised reticulation beneath. Flowers large, $1\frac{1}{2}$ -2in. on velvety drooping pedicels, $\frac{3}{4}$ -1in. long, 2-3 together from the swollen nodes of rigid stout racemes coming off from woody tuberosities. Bracts small, deciduous. Calyx finely velvety outside, lined with white, silvery hair. Segments acute. Keel very deeply boat-shaped, acute. Pod pendulous, 5-8in., by about $\frac{1}{2}$ in. wide, on a densely, woody stalk, $\frac{3}{4}$ in. long, obtuse, thickened at sutures, leathery, transversely veined, densely but finely pubescent, especially at end. Seed $1\frac{1}{4}$ in., flat, broadly oval, smooth reddish-brown. Flowers orange-scarlet, very silvery outside, with silky hair, so that the buds are white.

Uses:—The Gum.—This is known as Bengal or Butea Kino. Nearly the whole of the so-called Kino of our bazaars is this substance. Dr. Waring (in his *Bazaar Medicines*, p. 31) remarks that this is of little moment, since it appears to be equally effectual. He says: "It is an excellent astringent, similar to catechu, but being mild in operation it is better adapted for children and delicate females." The dose of the powdered gum is 10 to 30 grains, with a few grains of cinnamon." The addition of a little opium increases the efficacy.

The fresh juice is used in phthisis and hæmorrhagic affections. It is also employed as an application to ulcers and relaxed sore-throats. As an astringent, it is given in diarrhœa and dyspepsia. In the Concan, it is prescribed for fevers. "The use of the gum as an external astringent application is mentioned by Chakradatta; it is directed to be combined with

other astringents and rock-salt. He recommends this mixture as a remedy for pterygium and opacities of the cornea" (*Dr. Dymock, Mat Med., W. Ind., 187*). U. C. Dutt informs us that the ancient Hindus used the gum as an external astringent only.

The seeds internally are administered as an anthelmintic, but regarding the reliance which can be put upon their action considerable difference of opinion prevails. Some medical men think that they can be advantageously substituted for *santonine*, while others view them as much less powerful. They have at the same time a warm purgative action which often proves injurious to their anthelmintic property. They are, however, largely used in the treatment of round-worm. The following extract from *Dr. Waring's Bazaar Medicines* will be found to give the leading facts regarding these seeds: *Butea* seeds are thin, flat, oval or kidney-shaped, of a mahogany-brown colour, $1\frac{1}{4}$ to $1\frac{3}{4}$ inches in length, almost devoid of taste and smell. European experience has confirmed the high opinion held by the Mohamedan doctors as to their power in expelling *lumbrici* or round-worms, so common amongst the Natives of India. The seeds should be first soaked in water and the testa or shell carefully removed; the kernel should then be dried and reduced to powder. Of this the dose is 20 grains thrice daily for three successive days, followed on the fourth day by a dose of castor-oil. Under the use of this remedy, thus administered in the practice of *Dr. Oswald*, 125 *lumbrici* in one instance, and between 70 and 80 in another, were expelled. It has the disadvantage of occasionally purging when its vermifuge properties are not apparent: in some instances also it has been found to excite vomiting and to irritate the kidneys, and though these ill effects do not ordinarily follow, yet they indicate caution in its employment." (*Bazaar Medicines, Waring, pp. 31-32*). In the *Bhāvaprakāsa*, the use of the seeds of the *palāsa* as an aperient and anthelmintic is noticed; and they are directed to be beaten into a paste with honey for administration. *Sārangadhara* also recommends them as anthelmintic (*Dr. Dymock*). Externally, the seeds, when pounded with lemon-juice and applied to the skin, act

as a rubefacient. I have used them successfully for the cure of the form of herpes, known as dhobie's itch (*Surgeon-Major Dymock*, p. 188). When made into a paste, they are used as a remedy for ringworm.

The flowers are astringent, depurative, diuretic, and aphrodisiac; as a poultice, they are used to disperse swellings and promote diuresis and the menstrual flow. They are given to *enciente* women in cases of diarrhœa, and are applied externally in orchitis.

The leaves are described by the *Makhzan-ul-Adwiya* as astringent, tonic, and aphrodisiac, are used to disperse boils and pimples, and are given internally in flatulent colic, worms, and piles.

The bark, according to Rheede's *Hortus Malabaricus*, is given in conjunction with ginger in cases of snake-bite.

"I have tried the seeds of *B. frondosa* internally in numerous cases, and they are neither purgative nor febrifuge, at least not in one-drachm doses,—the largest quantity I have yet used. There is, however, no doubt that they are anthelmintic, at least to some extent. Administered in powder, morning and evening, for 2 or 3 days, and followed by a dose of some purgative, they generally expel from 1 to 3 or 4 round-worms, but failure is more frequent than success. That these seeds are not powerful enough to act always against the worms, is proved by the expulsion of the latter in large numbers in many cases by the use of santonine immediately after having failed with butea seeds. Both the kernel and the testa of the seeds possess the anthelmintic property. Dose of the powder for an adult from 30 grains to 1 drachm. Four grains is an average dose for a child of 4 years.

The inspissated juice of this plant (the Butea Kino of Indian commerce) is a good astringent, and as such is useful in all the complaints in which the true Kino is indicated. It has been used in the same forms as those of the latter, but in somewhat larger doses,—viz., from 15 to 40 grains (*Honorary Surgeon Moodeen Sheriff, Khan Bahadur, Madras*).

This is a fairly useful anthelmintic and a good substitute for santonine, in some cases acting very well, indeed.

Preparations.—Powdered seeds, dose fifteen to thirty grains twice or thrice a day, followed by castor-oil on the succeeding morning. The gum has been only lately used in this hospital; but as an astringent, it is found to be a useful substitute for kino in the ordinary cases of diarrhoea and dysentery, of children especially. Preparations and dose, &c., are similar to Kino." (*Apothecary F. G. Ashworth, Kumbakonam*). The leaves are astringent and used by the Natives as a poultice to dispel tumorous hæmorrhoids, buboes, etc. The seeds are anthelmintic in doses of 20 grains. The gum is very astringent, and, in doses of five grains, most useful in checking serous diarrhoea. In large doses, it is efficacious in hæmorrhage from the stomach and bladder. A strong solution of the gum is said to be a useful application for bruises and erysipelatous inflammations." *Surgeon R. A. Barker, Doomka.*

The seeds contain 18·2 per cent. of fat (Waeber, 1386). The oil is yellow, nearly tasteless and solidifies at 10° (Lepine). Brant records the specific gravity at 0·927.

387. *B. superba*, Roxb. H.F.B.I., II. 195, Roxb. 541.

Sans. :—Latâ-palâsa.

Vern. :—Tiwat, tiwas, palâs-wél (Bom.); Tiga-muduga (Tel.); Latâ-palâsh (B.); Nari-murup (Santal); Vél-khâkar (Guz.); Bel-palâs (Dec.); Kodi-murukkam, kodi-palsham (Tam.); Balli-muttaga (Kan.); Valliplâch-aha, valli-muruk-ka (Mal.).

Habitat :—Forests of the Concan, Bengal, Orissa, Burma, Oudh, Central India, and the Circars.

A gigantic climber. Bark dark brown, thick, very fibrous. Wood dark-brown, very porous and fibrous. It yields a gum like Kino. Stems thick as a man's leg. Does not differ from *B. superba* in botanic characters; leaves and flowers scarcely distinguishable from *B. superba*. Leaflets and flowers larger, says J. G. Baker. Leaflets chartaceous, acuminate, says Brandis. Flowers of a gorgeous orange colour on pedicels 3 times the length of Calyx. Lower Calyx-teeth lanceolated, deltoid. Keel

much curved, acute, 4.5 times as long as the Calyx. Pod distinctly stalked.

Use:—As a remedy for the poisonous bites of animals, the people of the Concan use the root with an equal proportion of the root of *Nyctanthes* and *Woodfordia floribunda*, the seeds of *Cassia tora* and *Vernonia anthelmintica* and the stem juice of *Trichosanthes palmata* made into a paste with cow's urine, as a local application, and administer *Aristolochia indica* internally. In the heat-eruptions of children the leaf-juice is given with curds and yellow zedoary (*Dymock*).

388. *Pueraria tuberosa*, D.C. H.F.B.I., II. 197.

Syn.:—*Hedysarum tuberosum*, *Roxb.* 580.

Vern.:—*Bidari-kand*, *bilai-kand* (H.); *Shimeeya*, *batrajee* (B.); *Sural*, *siali* (Pb.); *Daree*, *goomodee* (Tel.); *Gorabel* (Raj.); *Dâri* (Bomb.); *Karwia-nai* (Guz.).

Habitat:—Hills of the Konkan, Dekkan, Canara, West Himalaya, Simla, Kumaon, Orissa, Nepal, Circars, Behar, Chota Nagpore.

A large-deciduous, pubescent climber, with woody tuberculated stem, tuberous rooted. Bark brown $\frac{1}{2}$ in. thick, peeling off in vertical strings. Wood very porous, soft, perishable, white when fresh cut, afterwards turning brown, fibrous. The pretty purple blue flowers appear before the leaves. Leaves of 3 leaflets. Leaflets broadly ovate, entire or sinuate, pointed, long stalked; smaller equally sided. Flowers $\frac{2}{3}$ in. long, in small clusters, crowded in long, paniced racemes. Calyx $\frac{1}{3}$ in. densely covered with red brown hairs; teeth short acute, 2 upper nearly or quite united. Standard orbicular; keel nearly straight, obtuse, slightly shorter than the wings. Upper stamen free at both ends, but connected at the middle with the sheath formed by the others. Ovary hairy; style glabrous, abruptly incurved at base; stigma small capitate, pod flat, densely grey, hairy, 2-3 in., deeply constricted between the seeds, tipped with persistent style-base. Seeds 2-6, separated by partitions.

Parts used:—The roots.

Use:—The root peeled and bruised into a cataplasm is

employed by the Natives of the mountains where it grows to reduce swellings of the joints (Roxburgh).

Also given as a demulcent and refrigerant in fevers (Watt). In Nepal, it is employed as an emetic and tonic, and is also believed to be lactagogue.

389. *Phaseolus trilobus*, Ait. H.F.B.I., II. 201, Roxb. 558.

Sans. :—Mudgaparni.

Vern. :—Mooganee (B.); Trianguli-mugani (H.); Rakhal-kulmy (H.); Pilli-pe-nsara (Tel.); Pani-pyre, nari-payir (Tam.); Arkmut, mukuya, Jangli math (Bomb.).

Habitat :—Wild, and commonly cultivated throughout India.

Perennial or annual twiners. Stems trailing to a length of 1-2ft., glabrous, slender, diffuse, at times slightly hairy, the hairs being deciduous. Stipules inserted above the base, $\frac{1}{4}$ - $\frac{3}{4}$ in., oblong. Leaflets more or less deeply 3-lobed, with the central divisions spatulate, membranous, glabrous, or with only a few obscure loose or short hairs, rhomboid or ovate, 1-2in. long. Flowers in a close deltoid head, on a peduncle, that usually overtops the leaves; pedicels very short. Calyx campanulate, $\frac{1}{24}$ - $\frac{1}{12}$ in., pale yellow, teeth deltoid. Corolla under $\frac{1}{4}$ in. long. Pod 1-2 by $\frac{1}{2}$ in., subcylindrical, glabrous, recurved, 6-12 seeded.

Use :—The Leaves are said to be tonic and sedative, and used in cataplasms for weak eyes (O'Shaughnessy, p. 317).

Said to be administered in Behar in decoction, in cases of irregular fever (Murray 126).

390. *P. Mungo* Linn., H.F.B.I., II. 203, Roxb. 556.

Sans. :—Mudga.

Vern. :—Mung, mûngi, muji (Pb.); Harimûng (H.); Hâli-mûng (B.); Mug (Mar.); Mag (Guz.); Puchapayrû, sirupayâru, patche-paira (Tam.); Wuthulu, patcha-pessara (Tel.); Hesaru, hesaru-bele (Kan.).

Habitat :—Wild, and universally cultivated in the plains throughout India, ascending to 6,000 feet in the N. W. Himalayas.

Stems annual, sub-erect in the typical form, 1-2ft. high, copiously branched from the base, clothed with fine, long, deciduous, brownish, silky hairs. Stipules $\frac{1}{4}$ - $\frac{1}{2}$ in. long, attached near the base; leaflets membranous, with scattered adpressed hairs on both sides, 2-4in. long, roundish, acute or sub-obtuse, deltoid or rather rounded at the base. Flowers about half a dozen at the very end of short peduncles, clothed like the stems; pedicels very short. Calyx $\frac{1}{8}$ - $\frac{1}{6}$ in.; lower tooth deltoid or lanceolate. Corolla $\frac{3}{4}$ - $\frac{1}{2}$ in., yellow. Pod $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long by $\frac{1}{8}$ - $\frac{1}{4}$ in. sub-cylindrical, slightly recurved, 10-15-seeded.

Use:—The pulse is used as a diet in fever. Considered by the Natives cool, light and astringent, but is difficult to digest; and is used to strengthen the eyes (Watt).

Var. radiatus, Linn. H.F.B.I., II. 203, Roxb. 557.

Sans.:—Māsha, hūrita.

Vern.:—Māsh, māj (Pb.); Māsh-kalāi (B.); Urud, urid, dord, thi-kiri (H.); Udid (Mar.); Adad, arad (Guz.); Patchay-pyre, panny-pyre (Tam.); Minu-mulu, karu-minu-mulu, patsa-pesalu (Tel.); Hasaru, uddu (Kan.); Cherupoiaar (Mal.).

Stems elongated, twining, densely clothed, as are the peduncles and pod, with ferruginous, deflexed, silky hairs; leaflets membranous, entire, rarely faintly-lobed; lateral ones obliquely ovate, pointed, terminal one rhomboid, oblong. Legumes smaller than those of *Phaseolus Mungo*, Linn. Seeds black, 6-8in. each pod.

Use:—The seeds are much used in medicine, both internally and externally, in paralysis, rheumatism and affections of the nervous system. Also used in fever, considered hot and tonic, useful in piles, affections of the liver and cough.

The root is said to be narcotic by Royle (O'Shaughnessy), and prescribed by the Santals as a remedy for aching bones (Campbell).

391. *Vigna catiang*, Endl. H.F.B.I., II. 205.

Syn.:—*Dolichos Catiang* Linn., Roxb. 560.

Sans.:—Rajamāsha.

Vern.:—Lobiya, raish (H.); Barbati (B.); Chowlai (Mar.);

Ghangra (Santal); Urohi-mahor-pat (Ass.); Chaunro (Sind); Caramunny-pyre (Tam.); Boberlu, alu-sundi, duntu-pesalu, bobra (Tel.); Tada-gunny, kursan-pyro, alasandi (Kan.).

Habitat :—Native, and universally cultivated in the tropical zone.

An annual sub-erect or twining plant, always glabrous or nearly so. Stipules $\frac{1}{8}$ - $\frac{1}{2}$ in. long, attached and persistent; leaflets membranous, 3-6 in. long, acute, very variable in shape, broad or narrow-ovate, or ovate-rhomboidal, with the two sides below the middle prolonged into obtuse lobes. Peduncles often exceeding the leaves, 3-6 flowered; pedicels very short. Calyx glabrous, under $\frac{1}{2}$ in.; teeth lanceolate or deltoid-cuspidate. Corolla yellow or reddish, twice the Calyx. Keel not prolonged into a beak. Pod in some of the cultivated forms one or even 2 ft. long, under $\frac{1}{2}$ in. broad, edible seeds 10-20.

Use :—Considered hot and dry, diuretic and difficult of digestion, and is used to strengthen the stomach (Baden Powell).

392. *Olitoria Ternatea*, Linn. H.F.B.I., II. 208, Roxb. 566.

Sans. :—Aparājita, asphota.

Vern. :—Kalizer, visnukranti, kava-thenthi (H.); Aparājita (B.); Kājali, gokaran (Bomb.); Kakkanam-kodi (Tam.); Dhanattar (Pb.); Garani (Guz.); Dintana, tella, mella, tella-dintana, nila-dintana (Tel.); Vishnu, kantisoppu, kirgunna, gokarna-mul (Kan.).

Habitat :—A common garden flower all over India.

A climber, with terete, slender downy stems. Stipules, linear, petioles $\frac{1}{2}$ lin. Leaflets ovate or oblong-obtuse, subcoriaceous, 1-2 in. long. Bracteoles roundish, obtuse, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Calyx $\frac{1}{2}$ - $\frac{3}{4}$ in.; teeth lanceolate, half as long as the tube. Corolla $1\frac{1}{2}$ -2 in. Standard lin. broad, bright blue or white with an orange centre. Pod 2-4 in. long, flattish, the valves not keeled on the face; 6-10 seeds.

Parts used :—The root, seeds, leaves and juice.

Use :—Sanskrit writers describe the root as laxative and diuretic, useful in ascites, fevers, &c. (Dutt).

In the Concan, 2 tolas of the root-juice are given in cold milk to remove the phlegm in chronic bronchitis; it causes nausea and vomiting. The juice of the root of the white-flowered variety is blown up the nostrils as a remedy for hemicrania (Dymock).

Mr. Mooden Sheriff speaks highly of the infusion of the root-bark as a demulcent in the irritation of the bladder and urethra; it acts at the same time as a diuretic, and in some cases as a laxative.

The seeds are purgative and aperient (Ph. Ind.).

The infusion of the leaves is used for eruptions (Watt).

The juice of the leaves, mixed with that of green ginger, is administered in cases of colliquative sweating in hectic fever (Taylor).

The juice of the leaves mixed with common salt is applied warm all around the ear in ear-aches, especially when accompanied with swelling of the neighbouring glands (A. C. Mukerji, in Watt's Dictionary.)

393. *Dolichos biflorus*, Linn., H.F.B.I., II. 210, Roxb. 563.

Sans. :—Kulatha.

Vern. :—Kalatt, kulat, barât, gulatti (Pb.); Koolthee (H.); Woolawooloo (Tam.); Kurti-kalâi (B.); Horec (Santal); Gahat, kalath, kulthi (Kumaon); Wulawalli, ulava (Tel.); Hurali, hurli (Kan.).

Habitat :—Himalayas to Ceylon.

An annual downy climber, rarely glabrescent. Stipules basifixed, $\frac{1}{4}$ in. lanceolate, scariose; leaflets entire, membranous, ovate, acute, 1-2 in. long, at first finely pilose on the faces. Flowers 1-3 together in the axils of the leaves; without a common peduncle. Calyx $\frac{1}{4}$ in., downy, teeth long, lanceolate, setaceous, much exceeding the tube. Corolla yellow, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Keel narrow, obtuse, rather shorter than the standard. Style filiform, minutely penicillate round the stigma, not bearded down the edge. Pod downy, $1\frac{1}{2}$ -2 by $\frac{1}{4}$ - $\frac{1}{3}$ in., much recurved, tipped with the persistent style. 5-6 seeds.

Use :—The seeds are used medicinally in the Punjab.

(Stewart). The decoction is used by Native females in leucorrhoea and menstrual derangements; it is also given to parturient females to promote discharge of the lochia (S. Arjun).

Sanskrit writers recommend the use of the pulse as a demulcent in calculous affections, cough, etc. Its employment is said to reduce corpulence. The wild variety is said to be particularly serviceable in eye diseases (Dutt).

394. *Cajanus indicus*, Spreng. H.F.B.I., II. 217, Roxb. 567.

Syn:—*Cytisus* Cajan, Willd. Roxb. 567.

Sans.:—Adhaki-tubarikâ.

Vern:—Tuvar, arhar, arhar-kî-dâl (H.); Arhar, oror, orol (B.); Kohlu, kehlu (Simla); Dângri, arhar, dinger, tohar (Pb.); Tur (C. P.); Tuvero, turdâl (Guz.); Tura, tuver (Bomb.); Turi, tur (Mar.); Tuvvar, tûr (Duk.); Thovaray, tuvarai (Tam.); Kandalu (Tel.); Togari, tovaray (Kan.); Tuvra (Mal.).

An erect shrub, widely cultivated; with slender sulcate grey silky branchlets. Leaves 3-foliate. Stipules minute, lanceolate. Leaflets 3, minutely stipellate, oblong-lanceolate, suture subcoriaceous, thinly silky above, densely beneath, indistinctly gland-dotted. Flowers in sparse, distinctly peduncled, corymbose racemes, often forming a terminal panicle; pedicels downy, 2-3 times the Calyx. Calyx $\frac{1}{4}$ in. Corolla 3 times the Calyx; standard yellow, or beautifully veined with red. Pod 2-3 by $\frac{1}{4}$ - $\frac{1}{2}$ in., finely downy, tipped with the lower half of the style, linear, straight, narrowed at both ends, 3-5-seeded, torulose, with oblique linear depressions between the non-strophiolate seeds.

Habitat:—Cultivated throughout India.

Use:—The pulse is said to be easily digested and suitable for invalids. It is said to be hot and dry; it produces costiveness, and is used in cold diseases. The leaves are used in diseases of the mouth. The expressed juice of the leaves is given with a little salt in jaundice (B. D. B.).

The pulse and leaves are mixed and made into a paste which is warmed and then applied over the mammae to check the secretion of milk (Lee of Mangalore.) A poultice made of its seeds will check swellings (Ummegudien, Native doctor, Madras, Watt).

395. *Cylista scariosa*, Ait. H.F.B.I., II. 219.

Vern.:—Rân ghevada (Mar.).

Part used:—The root.

Habitat:—Woods of the Concan, Dekkan, Canara and Orissa.

A woody, climbing shrub, with slender, finely downy branches. Leaves 3-foliate. Leaflets minutely stipellate, sub-coriaceous, ovate, or sub-rhomboidal, acute, 2-4 in. long, thinly grey, downy above, densely downy below. Flowers in copious, distinctly peduncled, lax or dense racemes; bracts long, membranous, ovate, caducous; pedicels short, densely pubescent. Corolla yellowish red, $\frac{1}{2}$ in. long. Calyx finally 1-1 $\frac{1}{4}$ in., teeth scariose and persistent, the lowest much the largest and boat-shaped, 1 in. broad, the two side ones smaller than the two upper. Corolla enclosed in the Calyx, the petals equal in length. Keel much incurved, truncate. Stamens diadelphous; anthers uniform. Ovary subsessile, 1-ovuled; style long, filiform, stigma capitate. Pod small, oblique, oblong, enclosed in the Calyx.

Use:—The root is collected by the herbalists and sold as a remedy for dysentery and leucorrhœa. It is also applied externally along with other drugs to reduce tumours. Its most remarkable property is astringency; a reddish lucid juice issues from it when cut, which, on drying, becomes black and brittle, and may be seen adhering to the short pieces of the dry root which are offered for sale (Pharmacographia Indica, Vol. I., p. 451).

396. *Flemingia strobilifera*, R. Br. H.F.B.I., II. 227.

Vern.:—Kasrant (Oudh); Simbusak (Santals); Bolu (Darjeeling), Bundar, Kanphuti (Bomb).

Habitat:—Himalayas, from Simla and Kumaon to Assam, Khasia and Chittagong.

An erect shrub, 5-16 ft. high. Branches slender, terete, velvety. Leaves obovate, lanceolate, sub-coriaceous, 3-8 in. long, green, glabrescent above, thinly silky, especially on the raised parallel erecto-patent ribs below. Stipules scariose, linear, $\frac{1}{4}$ - $\frac{1}{2}$ in.; petiole stiffly erecto-patent, $\frac{1}{8}$ -1 in. Racemes 3-6 in. long,

usually simple, the slender zigzag rachis densely grey-downy; bracts erecto-patent, short petioled, deeply cordate, $\frac{1}{2}$ -1 in. long, obscurely cuspidate in the typical form. Calyx $\frac{1}{4}$ in., finely pilose; teeth lanceolate, exceeding the tube. Corolla purple, little exserted. Pod oblong, turgid, $\frac{1}{4}$ - $\frac{3}{8}$ in. long, finely downy, 2-seeded (J. G. Baker).

Use:—The roots are used by the Santals in epilepsy (Rev. A. Campbell).

397. *F. chappar*, Ham., H.F.B.I., II. 227.

Habitat:—Eastern Himalayas, Behar, Ava.

General habit and inflorescence just as that of *Flemingia strobilifera* (R. Br.) Branches terete, with a thin coating of adpressed hairs. Leaves nearly as broad as long, rotundocordate, or broad cordate, acuminate, 2-4 in. Sub-coriaceous, green, glabrous above, minutely dewy, grey below; petiole $1\frac{1}{2}$ in. long. Recemes often paniced. Rachis more woody than in *F. Strobilifer*, the pubescence shorter. Bracts firmer, less distinctly veined, much broader than long. Calyx $\frac{1}{8}$ - $\frac{1}{2}$ in.; teeth lanceolate, as long as the tube. Corolla twice the Calyx. Pod as in *F. Strobilifer*.

Use:—It is used just like the preceding species.

398. *F. grahamiana*, W. & A. H.F.B.I., II. 228.

Habitat:—Nilghiris.

A low, erect shrub, with tomentose young shoots. Branches sub-terete. Stipules lanceolate, $\frac{1}{4}$ - $\frac{1}{2}$ in. Caducous; petiole $\frac{1}{2}$ -1 in. erecto-patent not winged. Leaflets obovate, obtuse or sub-acute, sub-coriaceous, 2-3 in. long, plicate, glabrous above, grey-silky, especially on the ribs beneath many of the veinlets are raised. Bracts linear erecto-patent, firm sub-persistent, $\frac{1}{4}$ in. Spikes dense, oblong, 1-2 in. long, often fascicled. Calyx shaggy, $\frac{3}{8}$ in., teeth plumose, linear-testaceous subequal. Corolla not exserted. Pod oblong, $\frac{3}{8}$ in. long, finely pubescent, and often covered with red viscous glands.

Use:—The source of Wars remained unknown until 1884, when it was ascertained to be the glands of the pod of *F. Grahamiana*; but, as far as I can ascertain, the drug has never been collected in India (Dymock).

399. *F. congesta*, Roxb. H.F.B.I., II. 228, Roxb. 572.

Vern:—Bara-salpan, bhalai (B. & H.); Batwasi (Nepal); Nipitmuk (Lepcha); Dowdola (Bom.).

Habitat:—From the Central Himalayas throughout India.

Var.—*nana*, H. F. B., II, p. 229.

Vern.:—Supta-kasunit (H.).

Syn.:—*F. nana*, Roxb. 572, *F. procumbens*, Roxb. 571.

Habitat:—Central and Eastern Himalayas and Concan.

An erect, woody shrub, 4-8ft. high, with terete, glabrescent, old and rather angular sulcate, silky, young branches. Stipules linear, $\frac{1}{2}$ in.; caducous; petiole 1-4in. sulcate down the face; not winged. Leaves digitately 3-foliate; leaflets subcoriaceous, thin, not plicate, 4-6in. long, narrowed to a long point, and downwards to a rather rounded base, green, glabrous above, thinly grey-silky beneath. Recemes dense, subspicate, axillary, oblong, 1-2in. long, sessile, often fascicled; bracts caducous, linear or lanceolate, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, silky on the back, not at all, rigid; pedicels short. Calyx $\frac{1}{4}$ - $\frac{3}{8}$ in., densely clothed with adpressed, shining, pale-brown, silky hairs, teeth linear-lanceolate, the lowest exceeding the others. Corolla scarcely exerted, keel obtuse. Stamens diadelphous, anthers uniform. Pod oblong; $\frac{5}{8}$ in. long, obscurely downy, 2-seeded.

Uses:—It is remarkable that its native properties are apparently quite unknown to the Native doctors (Watt).

The roots are used by the Santals as an external applicant to ulcers and swellings, mainly of the neck (Rev. A. Campbell).

From this is obtained the coloring product Waras. Waras consists of a purplish, resinous powder, which covers the seed pods. From Waras is obtained a compound, *Flemingin*, $C_{12}H_{12}O_3$ (J. Ch. S. 1898 T., p. 660).

400. *Dalbergia Sissoo*, Roxb. H.F.B.I., II. 231, Roxb. 533.

Vern:—Sisam, sisu, sissai (H.); Shisu (B.); Tali, safedar (Pb.); Sissai (Oudh); Nukku-kattai, zette (Tam.); Sissukarra (Tel.).

Habitat:—Plains throughout India proper, ascending to 5,000 feet in the Central Himalayas.

Parts used:—The bark, roots, leaves, mucilage.

A large, erect, deciduous tree. Bark between $\frac{1}{8}$ - $\frac{1}{2}$ in. thick, grey, exfoliating in narrow, longitudinal stripes. Wood very hard, close-grained; sapwood small, white; heart-wood brown, with darker longitudinal veins. Branches finely greyish, downy. Leaf-rachis zigzag. Leaflets large, 3-5, roundish, with a very distinct cusp, firm, soon glabrescent, 1-3 in. long. Flowers in short axillary panicles, which latter are much shorter than the leaves, the erect patent branches densely pubescent, racemoso-corymbose; pedicels short. Calyx $\frac{1}{8}$ in. deep, downy; teeth very short, the lowest rather the longest, lanceolate. Corolla yellowish, twice the length of the Calyx; standard with a long claw and round limb. Stamens 9 in one bundle, the sheath of the filaments being split only along the top. Pod thin, straight, strap-shaped, pale brown, glabrous, $1\frac{1}{2}$ -4 by $\frac{1}{4}$ - $\frac{1}{2}$ in., obtuse, with a stalk twice as long as the Calyx, 1-4-seeded. Seeds $\frac{1}{4}$ in. long, kidney-shaped, flat.

Uses:—The raspings of the wood are officinal, being considered alterative (Beddome).

Useful in leprosy, boils, eruptions and to allay vomiting. (*Punjab Products*.)

The roots are said to be so astringent that they are neither eaten by rats nor ants. The oil is applied externally in cutaneous affections (Atkinson).

The mucilage of the leaves mixed with sweet-oil is a good application in excoriations. A decoction of the leaves is given in the acute stage of gonorrhœa (Watt.)

The seeds give 9-1 per cent of oil.

401. *D. sympathetica*, Nimmo. H.F.B.I., II. 234.

Vern.:—Pentgul (Bomb.); Titâbli (Goa).

Habitat:—Hills of the Western Peninsula.

A large, scandent shrub; stems armed with blunt or sharp twisted or straight spines, 6-10 in. long. Leaves 4-6 in. long; rachis softly pubescent; leaflets 11-15, ovate-oblong, obtuse, or emarginate, coriaceous, thickly covered with grey or brown-silky hairs especially beneath, $\frac{3}{8}$ -1 by $\frac{3}{10}$ - $\frac{1}{2}$ in.; petiolules $\frac{1}{16}$ in. long. Panicles peduncled; the ultimate branches secund, corymbose.

Calyx $\frac{1}{2}$ in. long, with a pair of obtuse, hairy, adpressed bracteoles. Corolla twice as long as the Calyx. Stamens 10, monadelphous, deeply divided into 2 bundles of 5 each, ovary pubescent. Pod thin, strap-shaped, apiculate, 2-4 by $\frac{3}{4}$ -1 in., 1-3-seeded, thinly brown-tomentose, the place of the seed distinctly marked; stalk short (TALBOT).

Use:—The leaves are used in Goa as an alterative. The bark is used as a *lêp* to remove pimples (Dymock).

402. *D. lanceolaria*, Linn. H.F.B.I., II. 235.

Syn.:—*D. frondosa*, 266, Roxb. 534.

Vern:—Takoli, bithûa (H.); Chakemdia (B.); Piri (Kol.); Chapot-siris (Santal.); Bander-siris (Nepal); Pâssi (Raj.); Dandous (Sind); *Jakoli*, *harrani*, *gengri* (Bomb.); Kanrchi, dandusa (Mar.); Barbat, parbâti (Banswara); Gengri (Panch Mahals); Nal-valanga (Tam.); Erra-pachchari, pedda-sopara, yerra-patsaru, pasarganni (Tel.).

Habitat.—Plains from the West-Himalaya to Ceylon. N. Kanara, Konkan and (Khandesh), from Ajmer to Behar. Sikkim, Terai. A beautiful tree when covered with flowers and young leaves (BRANDIS).

A large erect, deciduous tree, with glabrous branches. Bark $\frac{1}{4}$ in. thick, compact, grey, smooth, exfoliating in thin, rounded patches. Wood white or yellowish-white, moderately hard; no heartwood (Gamble). Leaves 3-6 in. long, stipules minute, caducous. Leaflets about 15, ovate or obovate, obtuse, emarginate glabrous, dark-green above, much paler beneath, coriaceous, $\frac{3}{4}$ -1 $\frac{1}{2}$ by $\frac{1}{2}$ - $\frac{3}{4}$ in.; lateral nerves numerous, parallel, prominent on upper surface (Talbot). Brandis says:—"Leaflets 11-17, 1-2 in. long, not black when dry, ovate or obovate, obtuse, secondary nerves more distinct than the reticulate veins joining them. Flowers in short, unilateral and axillary panicles, with spreading branches." "Panicles," says Talbot, "clothed with rufous pubescence, large lax, terminal and axillary, appearing when the tree is bare of leaves." Calyx brownish-purple, the two upper Calyx-teeth obtuse, the 3 lower acute. Corolla pale, pink; standard broadly obovate. Stamens 10, in 2 bundles of 5 each. Pod

1½-4 by ½-¾in., narrowed at both ends, glabrous, 2-3-seeded, long-stalked, oval, compressed (TALBOT).

Uses:—The bark and an oil obtained from the seeds are medicinally used by the Natives (Beddome).

The Santals use the bark along with that of *Flacourtia Ramontchi* as an external application during intermittent fever. The leaves and the roots are also employed medicinally (Rev. A. Campbell).

403. *D. volubilis* Roxb. H.F.B.I., II. 235, Roxb. 536.

Vern.:—Aleí, Munganver (Bomb.); Bandee-gurjun (Tel.); Bhatia, bankhara (H.); Bir-munga, nari-siris (Santal.); Nubari (Uriya); Rangdi (Mal.); Bhatia (Kumaon).

Habitat.—Sub-Himalayan tract, from Kumaon eastward; Oudh forests, Bihar, Central and Southern India. Phoondaghaut, near Sawantwadi, in the Bombay Presidency. Common in Burma and the Andamans.

A large scrambling or climbing unarmed tree, with green glabrous, circinate branches, *i. e.*, often bent and twisted into spinal hooks. Bark thin, brown, peeling off in flakes, wood light-brown, hard (Gamble). Leaves 4-6in. long; rachis pubescent. Leaflets 9-13, elliptic or obovate, often minutely mucronate at apex, 1-2in. long (Brandis); or 11-13, thin glabrous, oblong, obtuse, apiculate, terminal largest; petiolules ½in. long. (Talbot). Flowers small, curved, pale-blue, in compact, large, pubescent panicles. Corolla pale-lilac, says Talbot. Stamens 10in., 2 bundles of 5 each. Pod 2-3in. long, ¾in. broad, 1- rarely 2- seeded, linear-oblong, obtuse, stalked, glabrous, thickened and veined opposite the seeds.

Use:—In the Concan, the juice of the leaves is applied to aphthæ, and used as a gargle in sore-throat. The root-juice, with cumin and sugar is given in gonorrhœa (Dymock).

404. *D. spinosa*, Roxb. H.F.B.I., II. 238. Roxb. 536.

Habitat:—Tidal forests along the coasts, from Chittagong to Tenasserim; also on the Ghats and on the coast of the Western Peninsula.

A large shrub, sometimes scandent. Bark blackish-grey, rough, vertically fissured. Wood brownish-white, in alternate bands of varying width of woody and bast texture and with a dark-red, hard centre (Gamble). "A rigid, wiry, scrambling shrub" says Brandis, "with soft, silvery white wood, armed with stout divaricating branchlets, ending in pungent spines." Talbot thus describes the plant:—"A stiff, erect, glabrous shrub, with horizontal branches, spine-tipped at the ends." Entirely glabrous. Leaves fascicled on the node of branches; leaflets 7-11, often nearly opposite, ovate-oblong, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers yellowish-white, in congested, sessile, axillary panicles; pedicels short. Calyx $\frac{1}{10}$ in. long, minutely downy, teeth short, obtuse. Corolla twice as long as the Calyx. Stamens 10 in., a single sheath, sometimes in 2 separate sheaths of 5 each. Pod 1 in. long, reniform, coriaceous, flat, 1-seeded, brown, glabrous.

Use:—The roots powdered absorb alcohol, and a spoonful of the powder in a tumblerful of water is said to be sufficient to destroy, in less than half an hour, the effects of alcohol, even in cases bordering on delirium tremens (Kurz).

405. *Pterocarpus santalinus*, Linn. *Fil.* H.F.B.I., II. 239, Roxb. 536.

Sans.:—Raktachandana.

Vern.:—Ragat-chandan, lâlchandan, undum (H.); Rakta-chandan (B.); Shenshandannum, segappo-shandanum (Jam.); Erragandhapuchekka, kuchandanum (Tel.); Kempu-gandha (Kan.); Ooruttah chundanum (Mal.); Lâl-chundan (Dec.); Raktachandan, ratanjli (Bomb.).

Habitat:—South India, chiefly Cuddapah, North Arcot and the southern portion of the Karnool District.

A smooth tree, attaining 25 ft. Bark blackish-brown, deeply cleft, both vertically and horizontally into rectangular plates. Wood extremely hard. Sapwood white, heartwood dark, claret-red to almost black, but always with a red tinge, orange-red when fresh cut, the shavings giving an orange-red colour. Branches obscurely grey-downy. Leaflets 3, rarely 4 or 5, broad-elliptic, obtuse, $1\frac{1}{2}$ -3 in. long, underside pale and clothed

with fine adpressed hairs. Flowers few, in short axillary or terminal racemes. Calyx $\frac{1}{2}$ - $\frac{1}{4}$ in., teeth deltoid, minute. Limb of standard not longer than the Calyx. Stamens 2-3, monadelphous.

Use:—There are three kinds of sandalwood, according to the Sanskrit writers—white, yellow and red. The red variety is considered astringent, tonic, and is used as a cooling external application for inflammation and headache. (Dutt.)

Considered by the Natives a hot remedy, useful in bilious affections and skin diseases, also in fever, boils, and to strengthen the sight. It also acts as a diaphoretic, and is applied to the forehead in headache (Baden Powell).

The wood, rubbed up with water, is advantageously employed as a wash in superficial excoriations of the genital organs (Surgeon-Major Gray). Used also over swelling of eyelids for reducing the swelling, (K. R. K.)

A decoction of the legume is useful as an astringent tonic in chronic dysentery, after separation of the slough (Surgeon-Major Shircore, Watt's Dictionary).

406. *P. marsupium*, Roxb. H.F.B.I., II. 239, Roxb. 536.

Vern.:—Bija, bijilar, peetshola (H.); Biblâ, huni, asan (Bomb.); Kandamiruga-mirattam, vengai (Tam.); Gandum-rugam-nettura, peddagi, pedei, zegi (Tel.); Karin-thagara (Mal.)

The gum—Kamarkas (H.); Chinâi-gond (Bomb.).

Habitat:—All parts of the Madras Peninsula, extending North to the Rajmahal Hills in Bihar and Central India.

A large, deciduous tree. Bark $\frac{1}{2}$ in. thick, grey, with long vertical cracks, exfoliating in small pieces of irregular shape and size. Wood very hard, close-grained, giving a red resin; sapwood small; heartwood yellowish-brown, with darker streaks. Leaves with soft adpressed hairs while young, dark green, shining. Leaflets 5-7, coriaceous, elliptic-obtuse, emarginate, sometimes shortly acuminate, glabrous when full grown. Secondary nerves 15-20 pair, with intermediate ones joined by prominent reticulate veins. Flowers yellow or white, pedicels much shorter than Calyx, in terminal panicles. Calyx

peduncles, and pedicels clothed with dark-brown hairs. Stamens monadelphous, the sheath deeply 2-fid. Corolla twice the length of the Calyx, $\frac{1}{3}$ - $\frac{1}{4}$ in., finely downy; teeth deltoid, the two upper ones largest. Pod 1-2 in., broad, often 2-seeded; orbicular; wing about $\frac{1}{2}$ - $\frac{3}{4}$ in.

Uses:—Not noticed by Sanskrit or Mahomedan writers. Natives on the Coromandel Coast use the gum for toothache (Ainslie). The bark of the tree is used in Goa as an astringent (Dymock). Kino is officinal in both Indian and British Pharmacopœias. It is used as an astringent in diarrhœa and pyrosis. Its action being milder, it is better adapted for children and delicate females (Ph. Ind).

Rumphius states that the gum cures diarrhœa, and the bruised leaves are useful as an external application to boils, sores, and skin diseases.

407. *Pongamia glabra*, Vent. H.F.B.I., II. 240.

Syn.:—*Galedupa indica*, Lam, Roxb. 538.

Sans.:—Karanja, naktâmla.

Vern.:—Karanja (H. & B.); Pungam-maram (Tam.); Kanuga-chettu, kranuga (Tel.); Kidâmâr (Mar.); Pongam, unnamaram (Mal.); Sookchein (Pb.).

Habitat:—Central and East Himalayas to Ceylon. Found especially near the coast, and commonly met with in the Concan.

A moderate-sized tree, almost evergreen. Bark soft, $\frac{1}{4}$ in. thick, greyish-brown, covered with tubercles. Wood moderately hard, white, turning yellow on exposure; no heartwood, leaves imparipinnate, glabrous, brightly green; leaflets 5-7 opposite sub-coriaceous, without stipels, ovate, shortly acuminate, 2-5 in. long. Flowers in simple, peduncled, axillary, pubescent racemes, nearly as long as the leaves, white and purple. Corolla $\frac{1}{2}$ in., standard silky on the back. Stamens 10, the 10th filament free at the base, in the middle connate with the rest. Pod woody, glabrous, turgid indehiscent $\frac{1}{3}$ - $\frac{1}{4}$ in. thick, 1 $\frac{1}{2}$ -2 in. long, with a short decurved point. Seed 1, 1 $\frac{1}{2}$ -2 in. long, oily.

Uses:—In Hindu medicine, the seeds are used as an external

application in skin diseases. The expressed oil of the seeds is used in these diseases as well as in rheumatism. A poultice of the leaves is applied to ulcers infested with worms (Dutt).

The juice of the roots is used for cleaning foul ulcers and closing fistulous sores (Ainslie).

The fresh bark is used internally in bleeding piles. A decoction of the leaves is used for medicated baths and fomentations in cases of rheumatic pains (S. Arjun).

The oil is useful in cutaneous affections (Ph. Ind. 79). Gibson speaks very highly of the oil as a remedy in scabies, herpes and other cutaneous diseases of a similar nature. It should be mixed with an equal quantity of lime or lemon juice and well shaken, when it forms a rich yellow liniment which I have used successfully in porrigo capitis, pityriasis and psoriasis; in an obstinate case, hydnocarpus oil, camphor and sulphur may be added with advantage. For destroying worms in sores, the juice of the karanj, nīm and nirgondi (*Vitex negundo*), hence called *kiḍāmār*, i.e., killer of worms or cutaneous vermin, is in common use. In leprosy, the leaves of the karanj and chitrak, mixed with pepper and salt, are powdered and given with curds (Dymock). K. R. Krishna has used it in cases of *Eczma Sicca* locally with benefit, with one dram of Zinc Oxide to one ounce of the oil.

Useful in whooping cough and chronic bronchitis (Surgeon B. Evers, i. m. s., March 1875, p. 66.)

Regarding the oil, Mr. Hooper writes :—

It is a thick oil, of a light orange-brown colour, with a bitter taste, probably due to a resin. By extracting the kernels with ether 33·7 per cent. of a buttery mass of a dirty yellowish colour was obtained. The residual cake contains 23·3 per cent. of proteins. Should a demand arise for this oil it could be obtained to an unlimited extent in Bengal.—(*Agricultural Ledger* 1911-12—No. 5 p. 140.)

The oil from its seeds at 15°, is a buttery mass of a dirty yellow colour. Two samples gave the following figures: Sp. Gr. 0·9352-0·9240 at 40°; Saponification number, 178-183·1; iodine number, 94·0-89·4; Reichert-Meissl number, 1·1; unsaponifiable matter, 9·22-6·96 per cent; refractometer number, 78·0-70·0; free fatty acids (as oxalic), 3·05-0·5 per cent. The first values were given by a sample extracted in the laboratory with ether; the second by a specimen obtained from India (Julius Lewkowitsch, *Analyst*, 1903, 28, 342-343.

408. *Sophora tomentosa*, Linn. H.F.B.I., I. 249, Roxb. 343.

Habitat:—Shores of the Eastern and Western Peninsulas and Ceylon.

An evergreen shrub or small tree. Branches, leaves and inflorescence shortly and thinly grey-tomentose. Branches virgate and persistently downy. Leaves $\frac{1}{2}$ ft long. Leaflets flexible, subcoriaceous, thick, obliquely elliptic-obtuse, 2 in. long, 11-17, dull grey-green, the veins immersed on both surfaces. Flowers sulphur-yellow, in terminal racemes, which latter are $\frac{1}{2}$ ft. long; pedicels densely silky, articulated a little below the Calyx. Calyx nearly truncate, very oblique $\frac{1}{4}$ - $\frac{3}{8}$ in. Corolla $\frac{5}{8}$ - $\frac{3}{4}$ in., blade of standard round, veined. Pod without wings or ridges, 4-6 in. long, hoary, 6-10-seeded, the oblong, hoary, seed-bearing joints separated by a narrow, long, seedless neck as long as or shorter than the seed-bearing joint.

Use:—Mr. F. M. Bailey states that the roots and seeds have been considered as specifics in bilious sickness in New South Wales (Mr. Maiden in the Ph. Journal, for Sept. 1st, 1889, p. 180).

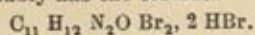
Considerable quantities of sophorine were extracted from *Sophora tomentosa*, and very carefully compared with pure cytisine, $C_{11}H_{14}N_2O$, with the result that these two alkaloids proved to be identical. During this investigation, many new characteristics of cytisine were determined, and new derivatives formed.

The rotatory polarisation of cytisine nitrate is $[d]_D - 93.26$, the co-efficient of refraction, 1.34419. Cytisine gives no reaction with strong sulphuric acid, or with that acid and sugar, cerous oxide, or Vanadic acid. Fröhde's reagent, and evaporation with phosphoric acid, likewise yield no reaction. Erdmann's reagent causes an orange-yellow coloration; concentrated nitric acid, on warming, a reddish yellow coloration, which becomes rather darker on the addition of potash; strong sulphuric acid and potassium dichromate, a green coloration; evaporation with hydrochloric acid leaves a yellow residue; calcium hypochlorite gives no coloration.

Methyloctytisine hydriodide, $C_{12}H_{16}N_2O, HI$; prepared by the action of methylic iodide on the free alkaloid, yields colourless crystals; its solution gives a rotary polarisation, $[d]_D = -81^\circ$, and a refractive index of 1.35427. The platinochloride crystallises in orange-yellow needles; the aurochloride in golden-yellow needles.

With bromine, cytisine yields an orange-red compound containing 4 atoms

of bromine, 2 of which are removed by digesting it with silver nitrate. The compound probably has the formula—



As both ulexine and sophorine are now proved to be identical with cytisine, this alkaloid has been shown to be present in the various species of *cytissus*; in *ulexuro-paens*, and in *sophora tomentosa* (By P. C. Plugge, *Archiv. Pharm.* 1894, pp. 444-460, *J. Ch. S.* 1895 A. I. 159.

409. *Cæsalpinia bonducella*, Fleming, H.F.B.I., II. 254, Roxb. 356.

Syn.:—Guilandina Bonducella, Linn.

Sans.:—Kuberākshi, pūtikaranga, latākaranja.

Vern.: Katkaranj, katkaranga, katkalejā, karanju, karanjavā, katkalijā, katkuliji-sāgar-ghôta (H.); Nâtâ, nâtû-karanja, natû-karanja (B.); Bagini (Santal.); Zang, kup (Lepcha); Katkaronja (Oudh); Karaunj (Kumaon); Kilgach, katkarânja (Ajmere); Gataran (Jabalpur); Kirbut (Sind.); Kâkâchiâ, gâjga, kachki (Guz.); Sagaragota (Cutch); Sâgurghota, gaja (Bom.); Sâgaragotâ, gajagâ, rohedo (Mar.); Gajâ, gutchka, gudgega (Duk.); Gajkai, gajagakagi, gajega (Kan.); Kazhar-shikkây kalichi, kali-balli shikkay, gechchakkay (Tam.); Gach-chakâza, gachclia (Tel.); Kazhanchikkurn, kinanchik-kuru (Mal.).

Habitat:—From the Himalayas, throughout India.

A scandent, prickly shrub. Bark light-brown. Wood hard. Leaves over a foot long; Pinnæ 6-8 pair; 3-8in. long; stipules large, 2-fid; rachis and its branches armed with recurved prickles. Leaflets 6-10 pair on each pinna, opposite 7-1 by $\frac{2}{3}$ - $\frac{3}{8}$ in., oblong or elliptic, obtuse, mucronate, membranous, downy beneath, minutely petioluled. Racemes 6-12in. long, gradually denser towards the top; pedicels $\frac{1}{5}$ - $\frac{3}{10}$ in. long, finely rusty tomentose. Petals $\frac{2}{3}$ - $\frac{1}{2}$ in. long, oblanceolate, yellow, the smallest spotted with red. Pod 2-3 by $1\frac{1}{2}$ -2in., coriaceous, dehiscent, thickly beset with sharp wiry prickles, $\frac{1}{5}$ - $\frac{3}{10}$ in. long. Seeds 2-3, $\frac{1}{10}$ in. long, globose or ovoid, shining, lead-coloured, with numerous very fine horizontal cracks when dry (KANJILAL).

Uses:—In an official report, the Madras Committee for the proposed revision of the Indian Pharmacopœia, remark that "the seeds are very useful and cheap and antiperiodic, antipyretic and tonic; valuable in all ordinary cases of simple,

continued and intermittent fevers. They have also been found useful in some cases of asthma."

In Madras, an ointment is made from the powdered seeds with castor oil and applied externally in hydrocele and orchitis (Watt. ii 406.)

In Malay, the young leaves are used in intermittent fevers and for expelling intestinal worms (Dr. Ch. Rice, Watt. ii. 5).

The seeds are officinal in the Indian Pharmacopœia, and useful in malarial fevers.

In disorders of the liver, the tender leaves are considered very efficacious (T. N. Mukerji).

In Cochin China, the leaves are reckoned as a de-obstruent and emmenagogue and that an oil expressed from them is useful in convulsions, palsy and similar complaints (Drury).

The seeds of *Casalpina bonducella* yield an alkaloid, for which the name *natin* is suggested. The oil has D₂₀ 0.9132, iodine value 96.1, and saponification value 202.8.

J. Ch. I. 15-4-1912, p. 357.

410. *C. bonduc*, Roxb. H.F.B.I., II. 255, Roxb. 358.

Habitat :—The Eastern and Western Peninsulas.

Very near *C. Bonducella*, *Fleming*, from which it differs by its more robust, less downy branches, larger leaflets (often 2-3 in. long), the absence of the reduced stipular pinna, by its smaller erect, not squarrose, bracts and more tropical dispersion (J. G. BAKER).

Uses :—The seeds of this are of a yellow color. Messrs Hæckel and Schlagendenhauffen have obtained from the cotyledons of both kinds a bitter principle as a white powder. Clinical experience is reported to have proved beyond doubt that this bitter principle represents the therapeutic properties of the seed, and Dr. Isnard reports that in doses of 10 to 20 centigrams its effects in intermittent fever equal those of the salts of quinine. (*Ph. Journal*, July 31st, 1886, pp. 8 and 12)

411. *C. Nuga*, Ait, H.F.B.I., II. 255.

Syn. :—*C. paniculata*, Roxb. 358.

Vern. :—Kaku mûllu (Mal.).

Habitat:—Chitagong, Sylhet, and the Eastern and Western Peninsulas.

A large, scandent, prickly shrub. Branches slender, very flexuous. Prickles copious, dark-coloured, hooked. Pinnæ 2-5 pair. Leaflets distinctly petioluled, $1\frac{1}{2}$ -2 in. long, obtuse, coriaceous, glossy above. Racemes axillary and terminal, copiously paniced, with spreading branches; pedicels as long as the calyx. Calyx glabrous, $\frac{1}{4}$ - $\frac{1}{2}$ in. Petals scarcely exserted. Filaments densely woolly in the lower half. Pod 2 in. long, broad oblong, coriaceous pointed at both ends, hard indehiscent, rather turgid, 1-seeded.

Use:—The roots of this plant are said to be diuretic; they have been reported as useful in gravel and stone in the bladder, and the juice of the stem has been used externally and internally in eye diseases. For the same purpose are used also the roasted fruits, which have a bitter taste. The finely powdered leaves have also been administered to women immediately after delivery as a tonic to the uterus (WATT. ii. 10).

412. *C. Sappan* Linn. H.F.B.I., II. 255, Roxb. 356.

Sans.:—Pâtang.

Vern.:—Bokam, tairi, patang (H. B.); Teri (Santal); Bokmo (Ooriya); Patang-na-lakaru, patang-mu-lâkado, bakam (Guz.); Patang-ki-lakri (Duk.); Patang (Mar.); Patanga, vatlangi, vattéku, vartangi (Tam.); Bakanûr, bakapu, okâunkatta, pattanga-katta, bakâun-chekka, bukkapu-chekka (Tel.); Patanga-chekke, sappanga (Kan.); Chappanum (Mal.).

Habitat:—The Eastern and Western Peninsulas.

A small sub-glabrous tree or struggling shrub. Wood hard. Sapwood white, heart-wood orange yellow, says Gamble. The heart-wood is red and takes a fine polish says Talbot. Prickles small and few. Leaf-rachis $\frac{1}{2}$ 1 ft. long, leaflets No. 30 moderately small oblong very oblique sessile coriaceous, Pinn No. 24. Panicles often as long as the leaves, the young branches, slightly perruginous-pubescent; bracts large, lanceolate caducous; pedicels $\frac{1}{2}$ $\frac{5}{8}$ in. Calyx $\frac{3}{8}$ in. Glabrous. Filaments densely woolly in the lower half, slightly exserted. Ovary grey velvety. Pod 3-4 in, by $1\frac{1}{2}$ in. sub-compressed, polished oblique oblong

woody 3-4 seeded indehiscent, with a hard recurved beak at the upper angle.

The dye is obtained from the pods and also from the heart-wood used specially for colouring silk.

Part used:—The wood.

Uses:—Ainslie says that the Vytians consider a decoction of the wood as a powerful emmenagogue, and remarks that the Cochin Chinese hold the same opinion.

The Indian Pharmacopœia recommends it as a good substitute for logwood.

Dr. Ross of Delhi considers it useful in some forms of skin diseases, lichen especially, given internally as a decoction. Assistant-Surgeon Bhagwan Das of Rawalpindi has found it useful as an astringent tonic in atonic diarrhœa (Watt. II. ii).

413. *C. pulcherrima*, Swartz H.F.B.I., II. 255, Roxb. 356.

Vern.:—Krishnachûrâ (B.); Ratuagandi (Kan.).

Habitat:—Cultivated in gardens throughout India.

A large glabrous shrub, armed with a few scattered prickles on branches. Bark silver grey, studded with prominent, but small length lenticels. Wood hard; Sapwood white, heart-wood orange-yellow, glabrous. Pinnæ 12-18 pair. Leaflets 20-24, small sessile, close, membranous, oblique-oblong. $\frac{1}{2}$ - $\frac{3}{4}$ in. long, very obtuse. Racemes very broad, the lower pedicels 3-4 in. long. Calyx $\frac{1}{8}$ in., glabrous. Petals round, crisped, reddish yellow to orange, or bright-yellow, with a distinct claw. Filaments varying in colour, according to the colour of the petals, 3-4 times the length of the Corolla, much exerted. Pod nearly straight, 2-3 in. long, thin, ligulate, flat, glabrous, 6-8-seeded.

Use:—The leaves, flowers and seeds are largely used in Native medicine (Watt).

414. *C. sepiaria*, Roxb. H.F.B.I., II. 256, Roxb. 357.

Vern.:—Uru, ûri, arlu, relû, aila, hyderkajhar (H.); Phulwai, uran, kando, uri (Pb.); Chillu (Duk.); Hotsige (Kan.).

Eng.:—Mysore Thorn.

Habitat:—Himalayas to Ceylon and Ava. Sutlej Valley. Basantpur, Sabathu, Western Peninsula.

A straggling, woody, thorny, stout climber. Branches finely downy, with small yellow prickles. Bark yellowish white, corky, with corky excrescences bearing strong thorns. Wood light-brown, moderately hard, with masses of reddish-brown harder wood near centre (Gamble). Leaves 2-pinnate, 10-18 in. Leaflets 10-24, opposite nearly sessile, oblong, $\frac{1}{2}$ -1 in., obtuse; Trimen from Ceylon notes 20-24 leaflets (10-12 pair); $\frac{3}{8}$ in., sessile, closely placed, over-lapping, oblong, very obtuse, pubescent on both sides, thin. Flowers large, bright, chrome-yellow; filaments crimson, $1\frac{1}{4}$ in.; pedicel $1-1\frac{1}{4}$ in., stout, hairy, ascending. Racemes terminal, large, 6-12 in. long, erect. Bracte long, lanceolate, acuminate, caducous. Calyx finely, but densely, pubescent. Segments very obtuse, petals shortly clawed, reflexed. Stamens much exserted. Filaments woolly for more than lower half. Ovary sessile, style glabrous; stigma small. Pod glabrous, cuspidate, nearly flat, obliquely oblong, 2-3 by 1 in., tipped with the persistent style base. Seeds 4-8, mottled (Collet); 6-8, oblong, $\frac{5}{8}$ in., greenish, mottled (Trimen); compressed.

Use:—In Chamba, the bruised leaves are applied to burns. (Stewart, p. 60).

415. *C. digyna*, Rottl. H.F.B.I., II. 256.

Syn.:—*C. oleosperma*, Roxb. 356.

Vern.:—Vákeri-mul (H. and Bomb.); Umul-koochi (B.); Noonni-glika (Tel.); Vákeri-che-bhâte (Bomb.).

Habitat:—Eastern and Western Peninsula, Assam, Bengal, Chittagong, Burma, upper and lower; Sambalpur (C. P.). Ceylon. Eastern Himalaya.

A large, scandent, woody shrub, sparingly prickly. Branches glabrous, purple, with hooked brown prickles, which latter are scattered and uniform. Young parts rufous-pubescent. Leaves narrow, main rachis 6-8 in., with 9-12 pair of pinnæ, with rachis $1\frac{1}{2}$ -2 in. pubescent. Leaflets 20-24 (10-12 pair), $\frac{3}{8}$ in., sessile, closely placed, overlapping, oblong, very obtuse, pubescent on both sides, thin, dark-green, membranous. Flowers $\frac{1}{2}$ in., yellow; pedicel 1 in., horizontally divaricate,

slender; raceme stalked axillary, 6-8in. Bracts setaceous, falling very early. Calyx glabrous, segments separating from flat base. Stamens a little exserted. Filaments very woolly for more than basal half. Petals orbicular, yellow, the upper streaked with red (Brandis). Trimen from Ceylon simply says flowers yellow. Brandis is more accurate. I have seen the plant on Malabar Hill, Bombay, and in Ratnagiri District, on Rājāpur Hills. Develops a big starchy tuber or tubers several feet underground from the roots.

Pod oblong, glabrous, 1½-2in. long, 2-4-seeded, turgid, torulose.

Parts used :—The roots.

Use :—The root is used in Native practice, and has marked astringent properties. It might be used as such (S. Arjun). It is given internally, in 6 māsā doses mixed with milk, ghee, cumin and sugar, in phthisis and scrofulous affections; when sores exist it is applied externally as well; a kind of tuberculous swelling which is found on the root is preferred (Dymock).

In some parts of Burma, the root, pounded and mixed with water, is drunk as a febrifuge by some people, and is said also to have an intoxicating effect.

Previous investigations have shown that the pod-cases of *Caesalpinia digyna* are useful as a tanning material; of six samples, one contained 45·45 per cent. of tannin (referred to the dry substance), whilst in the other five the tannin content ranged from 53·82 to 59·89 per cent. The plant occurs plentifully in a wild state in Burma and in Bengal and Assam, and its cultivation in India has been recommended. An experiment consignment of the whole pods was sold recently in London at £14 per ton. As practically the whole of the tannin is contained in the pod-cases, a very large quantity of the seeds would be available if the pods were used commercially as a source of tannin. The results of analyses indicated that if finely ground and mixed with a cheap ground pulse, the seeds might be used for cattle-feeding in India, but they could not be exported profitably. J. Ch. I., Aug. 15, 1912, p. 735.

"The powdered seeds yield to ether 25·3 per cent. of a thick light colored oil worthy of further investigation." *Agricultural Ledger*, 1911-12 No. 5, p. 138.

416. *Wagatea spicata*, Dalz. H.F.B.I., II. 260.

Vern.:—Wagati, Wâkeri, Kuldgajga (M.); Hooliganji, Vagati (Kan.).

Habitat:—Western Presidency.

A robust, woody, prickly, climbing shrub, with long trailing prickly branches. Leaves abruptly bipinnate, $\frac{3}{4}$ -1 ft. long and broad. Pinnæ 8-10 pair; leaflets glabrous, elliptic-oblong, 1-2 in. long, nearly sessile, oblong, acute, rigidly sub-coriaceous, venulose. Flowers nearly subsessile, in long dense spikes, bright scarlet on a thick furrowed brown-velvety rachis. Bracts minute, lanceolate, cuspidate. Calyx scarlet, campanulate, $\frac{3}{8}$ in., segments 5, the lowest much longer than the others. Petals orange, 5, equal, oblanceolate, inserted with the stamens on the side of the disk lining the Calyx-tube. Pod indehiscent, 4-5-seeded, more or less constricted between seeds.

Use:—The pods (*Tere pods*) contain a large proportion of tannic acid. Roots used in cases of pneumonia (Talbot's List of Trees, Shrubs and Woody Climbers of the Bombay Presidency, 2nd edition, p. 143). Bark yields a dye material and is used as an application for skin diseases.

 417. *Cassia Fistula*, Linn. H.F.B.I., II. 261, *Roxb.* 348.

Syn.:—Cathartocarpus Fistula (Pers.).

Eng.:—The Indian Laburnum or Purging Cassia.

Sans.:—Suvarnaka, âraghadha, râjataru.

Vern.:—Amaltás, girmálah (H. and D.); Alash, ali, karangal, kiar, kaniár (Pb.); Rajbriksk, kitola (Kumaon); Râjbrikskha (Nepal); Chimkani (Sind.); Sundáh, sonali, ámultás, bandarlati (B.); Nurnic (Santal.); Hari (Kol.); Sonalu (Garó); Sanaru (Ass.); Bandolat (Cachar); Sandari or Sunari (Uriza); Kitawáli, sitoli, itola, bhimarra, sim (N. W. P.); Warga (Oudh); Jaggarwah, raila, pirojah, karkacha (C. P.); Jaggra, jugarúa, kambar, rera (Gond.); Báhavá, bháwá, baya, bawa (Mar.); Garmal or Sarmálâ (Guz.); Kouraih-kây, sharak-kouraik-kây, koue (Tam.); Reylu,

rêlarâla, rêla-kâyalu, suvarnam (Tel.); Konak-kâya (Ma.); Kakee (Kan.).

A moderate-sized, deciduous tree, at times large, erect, glabrous in all its parts. Bark $\frac{1}{4}$ in. thick, compact, greenish-grey and smooth when young, dark-reddish brown and rough when old, exfoliating in many-sided patches. Wood very hard; sapwood large; heart-wood varying in colour from grey or yellowish-red to brick-red, darkens much on exposure (Gamble). Youngest shoots silky. Branches slender. Leaves 12-18 in. long. Leaflets 4-8 pair, ovate or ovate-oblong, acute or shortly acuminate, base cuneate; 2-5, $1\frac{1}{2}$ - $3\frac{3}{4}$ in., sub-coriaceous, glabrous and bright-green above, pale, and more or less silvery-pubescent, particularly on nervation beneath; lateral nerves numerous, branching; petiolules $\frac{1}{4}$ - $\frac{1}{2}$ in. long; stipules minute-pubescent. Flowers large, fragrant, bright-yellow, in lax pendulous racemes, 12-20 in. long; Pedicels $1\frac{1}{2}$ - $2\frac{1}{2}$ in. long, pubescent; bracts minute, caducous. Calyx 4 in. long, divided to the base; segments oblong, obtuse, puberulous. Corolla $1\frac{1}{2}$ in. across; petals obovate, veined, shortly clawed. Stamens all antheriferous; 3 lower largest, with curved filaments, and oblong anthers, dehiscing longitudinally; 4, with short filaments, the anthers dehiscing by basal-pores; the remaining 3 short, anthers without pollen. Pod cylindrical, 1-2 ft. long, 1 in. thick, pendulous, smooth, shining, dark-brown indehiscent; seeds numerous, horizontal, in black sweet pulp and completely separated by thin transverse dissepiments; small, ovoid, slightly compressed, smooth, shining, yellowish-brown, cotyledons flat, albumen horny (TALBOT).

Parts used:—The pulp, root-bark, flowers, bark, leaves and roots.

Uses:—In Hindu medicine, the pulp is used as a cathartic; and the root is also described as a laxative, useful in fever, heart disease, retained excretions, biliousness, &c. (Dutt). In the Makhzan-El-Adwiya, the pulp is described as lenitive, useful for relieving thoracic obstructions and heat of blood, and is a safe aperient for children and women. Externally, it is said to be a good application for gout, rheumatism, &c. The flowers are

made into a confection known as *Gul-kand* and viewed as a febrifuge. From 5 to 7 of the powdered seeds are prescribed as an emetic, and the shell of the pod rubbed down with saffron, sugar and rose-water, in difficult parturition (Dymock). In the Concan, the juice of the young leaves is used to cure ringworm and to allay the irritation caused by the application of the marking-nut juice (Dymock).

The root is given as a tonic and febrifuge (Bellew). Dr. Irvine found the root to act as a strong purgative (Top. of Ajmere.)

It is officinal in the Indian and British Pharmacopœias.

A poultice made of the leaves is said to relieve the chilblains which are common in Upper Sind. It has been beneficially used in facial paralysis and rheumatism when rubbed into the affected parts. *Internally*, it is given as a derivative in paralysis and brain affections.

By steam-distilling the finely powdered fruit of *Cassia fistula*, a dark-yellow volatile oil, possessing a honey-like odour, is obtained. The oil forms an amorphous mass at ordinary temperatures, melts at 41°C, and has a faint acid reaction. The water which distils over with the oil, contains normal butyric acid. J. S. Ch. I. April 30, 1901, p. 386.

418. *C. occidentalis*, Linn. H.F.B.I., II. 262.

Syn.:—*Senna occidentalis*, Roxb 352.

Eng.:—The Negro Coffee.

Sans.:—Kâsamara.

Vern.:—Kasondi, bari-kasondi or kâsundâ (H. and Duk.); Hikal (Bom.); Kâlkâshundâ (B.); Nâttam-tâkarais, peya-veri (Tam.); Kasindha (Tel.); Natram-takara (Mal.); (Kasundro Guz.)

Habitat:—Scattered from the Himalayas to the Western Peninsula, Bengal and South India.

A diffuse, sub-glabrous undershrub, a few feet high, usually only of annual duration. Leaves $\frac{1}{2}$ ft. long, with a single gland placed just above the base of the common petiole. Leaflets glaucous, fœtid, acuminate, 1-3 in. long, glabrous or finely pubescent, 6-10 ovate-oblong. Racemes short-peduncled, few-flowered, corymbose, axillary and forming a terminal panicle;

bracts thin, ovate acuminate, caducous, pedicels spreading, $\frac{1}{2}$ - $\frac{3}{4}$ in. Sepals obtuse, glabrous, $\frac{1}{4}$ - $\frac{1}{2}$ in. Petals $\frac{1}{2}$ in., yellow, with reddish veins. Pod 4-5 by $\frac{1}{3}$ in., rather recurved, glabrous sub compressed, distinctly torulose. Seeds 15-30.

Parts used:—The leaves, seeds and roots.

Uses:—Sanskrit authors regard it as possessing much the same medicinal properties as *C. Sophora*. Mahomedan writers describe it as alexipharmic useful in the expulsion of corrupt humors and to relieve cough (Dymock).

In the Concan, 2 to 6 gunjas of the seeds are pounded and heated with a tola of woman's or cow's milk, which is strained and given once a day as a cure for the convulsions of children, or 6 mâsha doses may be given to the mother or wet-nurse. In France and in the West Indies, the seeds are employed as a febrifuge. An infusion of the root is considered by the American Indians to be an antidote against various poisons (Dymock). The seeds and leaves are used externally in cutaneous diseases (T. N. Mukerji).

In the West Indies, the root is considered diuretic and the leaves taken internally and applied externally are given in cases of itch and other cutaneous diseases. The root is said by Martius to be beneficial in obstructions of the stomach and in incipient dropsy (Lindley). Among the country people of Porto Rico, a decoction of the leaves, roots and flowers is highly prized in hysteria. I have tried its effects in some cases and found it relieve the spasm. It is useful for expelling wind accumulated in the intestines of dyspeptic, nervous women. It is also used as a tonic and febrifuge (Dr. Amader in *Ph. J.*, 28-4-88).

The whole plant is purgative. Dose of leaves about 90 grains.

Professor Clonet has analysed the seeds. The following abstract of his views and results taken from the *Year-Book of Pharmacy*, 1876, p. 179, will be found instructive:—

“Fatty matters (olein and margarin), 4.9; tannic acid, 0.9; sugar, 2.1; gum, 28.8; starch, 2.0; cellulose, 34.0; water, 7.0; calcium sulphate and phosphate, crysophanic acid, 0.9; malic acid, sodium chloride, magnesium sulphate, iron, silica, together, 5.4; and achrosine, 13.58 parts in 100. The latter substance

was obtained by exhausting the powder of seeds, previously treated with ether, by means of alcohol of 60 per cent; the alcohol is distilled off, the syrupy residue treated with absolute alcohol, which dissolves out various constituents, leaving a solid brown-red mass, having when dry a resinous fracture, and being soluble in water, to which it communicates a garnet colour. It contains C, H, O, N, and S, but its exact composition has not been determined. (It is most likely a mixture of various bodies.) It is soluble also in weak alcohol, and in acids and alkalies. The colour cannot be fixed upon tissues by any known mordant. This circumstance induced the author to term it *achrosine*, or 'not colouring,' although being coloured itself."

419. *C. Sophera*, Linn. H.F.B I., II. 262.

Syn.:—*Senna Sophera*, Roxb. 352.

Sans.:—*Kâsamarda*.

Vern.:—*Banâr*, *kâsundâ*, *bâs-ki-kasôndî* (H.); *Kâl-kashî-undâ* (B.); *Sari-kasôndi*, *jangli-takla* (Duk.); *Kuwâdice* (Guz.); *Ran-tânkla* (Mar.); *Ponnâ-virai*, *periya-takar*, *perâ-virai* (Tam.); *Paidi-tangedu*, *nute-kashindha*, *kâsâ-mardhakamu*, *tagara-chettu* (Tel.); *Ponnâmtakara* (Mal.).

Habitat:—Common throughout India.

Closely allied to *C. occidentalis*, from which it differs by its more shrubby habit, more numerous smaller narrower leaflets and shorter, broader, more turgid, pods which are not usually torulose when mature.

Parts used:—The bark, leaves, seeds and roots.

Use:—Supposed by Sanskrit writers to have expectorant properties, hence the name *kâsamarda*.

It is noticed by Mohamedan writers as a remedy in snake-bite, the root being given with black pepper. The bark in the form of infusion and the powdered seeds, mixed with honey, are given in diabetes (Drury). In Madras, the infusion of the leaves is taken internally for gonorrhœa in its sub-acute stages, and it is also used externally for syphilis.

The bark, leaves, and seeds are used as a cathartic, and the juice of the leaves is viewed as a specific in ring-worm, specially when made into a plaster in combination with sandal-wood. A paste made from the root is sometimes used instead of the juice of the leaves. The powdered seed is used for the same purpose and also for itch.

This plant, like several others of the same genus, owes its medicinal activity to the presence of chrysophanic acid, sometimes called Rhein, form $C_{14}H_6O_2$ (O.H.₂). This substance belongs to the anthracene group of carbon compounds, and, like alizarin, is regarded as dioxyan thraquinone, $C_{14}H_6O_2$ $\begin{Bmatrix} OH \\ OH \end{Bmatrix}$. It crystallizes in six-sided prisms, is tasteless, and may be sublimed without decomposition; it is contained in Goa powder (50 per cent.), rhubarb, most varieties of dock, *Lichen orcella*, *Permelia parietina*, *Cassia alata*, *C. occidentalis*, *C. Tora*, &c. As met with in commerce, it is in the form of a light-yellow powder, soluble in benzol, chloroform, turpentine, and in the fixed and volatile oils to a large extent, sparingly soluble in ether and alcohol, and insoluble in water, glycerine, and in solid paraffin. It is dissolved by sulphuric and nitric acids (in the latter to a less extent), by caustic potash and by ammonia; fuses at 123°3 C., and boils at 232°2 C. At the latter temperature it is decomposed into a dark-green resinous substance, which is largely soluble in ether. Oil Jecoris dissolves twice its weight of the acid, yielding a mixture containing 70 per cent. Oil olivæ, Oil Pini sylvest., Creasotum, Oil Terebinth., Oil Lavand., and Vaseline, dissolve readily their own weight of acid, yielding mixtures containing 52 per cent.

"Taking advantage of its solubility in the fixed oils, a considerable saving may be effected by preparing ointments direct from Araroba. Oil olivæ thoroughly exhausts that substance, yielding the acid after removal of the oil by ether in a state of purity. The Singhalese doctors take advantage of this fact, and fry the leaves of *Cassia alata*, *C. Tora*, *C. occidentalis*, and *C. Sophera* in gingelly or castor oil. The strained product is used as an ointment for ring-worm and other skin diseases." (F. Laker Macmillan, *Phar. Journ.*, 15th March 1879.)

420. *C. obtusifolia*, Linn. H.F.B.I., II. 263.

Syn. :—Senna Tora and toroides, *Roxb.* 351.

Eng. :—The foetid Cassia.

Sans. :—Prabúnátha, dádamari, dámdadan.

Vern. :—Chakundá, panevár (H. & B.); Chakaoda arak. (Santal); Pawár, panwar, pawás, chakunda (Pb.); Panwar (N.-W.P.) takálá, tarotá, táklá, tánkli (Mar.); Kawário, kovariza (Guz.); Tánkalá, kowaria (Bom.); Tarota (Duk.); Ushittagarai, tarotak Tam.; Tagarisha-chettu (Tel.).

Habitat :—Found everywhere in Bengal, and widely spread throughout India.

An annual weed growing up into an undershrub. Leaves distinctly petioled, furnished with glands on the main rachis between the leaflets; glabrous. Leaflets 6, ovate-oblong, perfect, glaucous, membranous, 1-1½ in. Stipules large, linear sub-

ulate, caducous. Flowers usually in nearly sessile pairs in the axils of the leaves, of the upper very crowded. Corolla small, bright or orange-yellow. Sepals concave. Stamens sub-equal. Pods $\frac{1}{2}$ - $\frac{3}{4}$ ft. by $\frac{1}{4}$ in.; membranous, slender, sub-tetragonous, the sutures very broad. Seeds uniseriate, flattened in the same direction as the pod, truncately cylindrical, about $\frac{1}{8}$ in. long; length parallel to the suture.

Parts used:—The leaves and seeds.

Uses:—In Hindu medicine it has a great reputation in all kinds of skin diseases. Chakradatta recommends the seeds together with those of *Pongamia glabra* as a cure for ring-worm.

Mohamedan writers notice the closing of the leaves at night. They consider the seeds and leaves to have solvent properties in those forms of skin disease accompanied by induration, *e.g.*, leprosy, cheloid, psoriasis, &c. (Dymock).

The leaves are gently aperient; fried in castor oil, they are considered a good application to foul ulcers. The seeds ground with sour butter-milk are used to ease the irritation of itchy eruptions; and the root, rubbed on a stone with lime juice, is supposed to be one of the best remedies for ring-worm. The leaves are also used as a poultice to hasten suppuration (Ainslie). A warm remedy in gout, sciatica and pains in the joints (B. Powell.)

The medicinal properties are due to the presence of chrysophanic acid. (Vide a paper by Mr. Elborne on the analysis of the seeds in Ph. J., 22 Sept. 1888, p. 242).

421. *C. auriculata*, Linn. H.F.B.I., II. 263.

Syn.:—*Senna auriculata*, Roxb. 354.

Eng.:—The Tanner's Cassia.

Vern.:—Tarwar, tarver (H. & B.); Tarota (Berar); Taravada (Mar.); Awal, aval (Guz.); Awla (Cutch); Avári, ammera-verai, ávirai (Tam.); Tangedu, thágedu, tangar (Tel.); Avareke, tengedu, tangádi-gida, ávara-gidá, taravadagida (Kan.); Avara, ponnáviram (Mal.).

Habitat:—Wild in the Central Provinces, the Western Peninsula and South India.

A gregarious, pubescent, tall shrub. Branches virgate, irregularly-scattered, sometimes horizontally, sometimes vertically arranged. Leaves nearly sessile, underside finely grey-downy, 3-4 in. long. Leaflets 8-12 pair, obovate-oblong, or elliptic-oblong, obtuse, mucronate, $\frac{1}{2}$ -1 in. long, with a piliform gland at the base of each pair; stipules large, foliaceous, persistent. Flowers yellow in terminal corymbose, bracteate panicles, the lowest branches in the axils of leaves, the upper supported by pairs of stipules. Sepals concave, unequal. Petals clawed, crisped on margin, $\frac{3}{4}$ -1 in. long. Pod 3-4 by $\frac{2}{3}$ in., then hairy, ligulate, few-seeded, glabrous, flexible, dark-brown, with a distinct space between the uniseriate seeds (J. G. BAKER).

Parts used:—The bark and seeds.

Use:—The Vytians reckon the seeds amongst their refrigerants and attenuants, and prescribe them in electuary, in cases in which the habit is preternaturally heated or depraved. They also consider the powder of the dry seeds as a valuable external remedy (blown into the eye), in certain stages of ophthalmia. Of the electuary the dose is a small teaspoonful twice daily (Ainslie).

Dr. Kirkpatrick brings to notice the astringent properties of the bark, and speaks favorably of the use of the seeds as an application to the eyes in chronic purulent conjunctivitis (Catalogue of Mysore Drugs. Ph. Ind.)

The Singhalese pull the twigs and hold them in their hands, or apply them to their heads for the coolness which they diffuse: and they use the leaves in the S. of the island as a substitute for tea (TENNANT).

422. *C. obovata*, Collad., H.F.B.I., II. 264.

Syn.:—Cassia Senna, Linn. Senna obtusa, Roxb.

Eng.:—Country Senna.

Vern.:—Bhui-tarwad (Bom.).

Habitat:—The Western Peninsula, Mysore and South India, especially the Coromandel coast.

Sub-glabrous, scarcely shrubby, 1-4 ft. high. Leaf-rachis

without glands. Leaves distinctly petioled, 2-3in. long; leaflets obovate-oblong, 8-12, opposite, membranous, very glaucous, obtuse, with a minute mucro, $\frac{1}{2}$ -1 $\frac{1}{2}$ in. Stipules lanceolate persistent. Racemes distinctly, peduncled, equalling or exceeding the leaves; pedicels very short. Sepals glabrous, very obtuse. Corolla middle-sized, pale yellow, stamens very unequal. Pod thin, flat, oblong, much recurved, with a crest in the middle of the valve opposite each seed, 1-1 $\frac{1}{2}$ by $\frac{3}{8}$ - $\frac{3}{4}$ in., short-stalked, narrower suddenly at both ends, 6-12-seeded, suture very thin.

Use :—Along with *C. lanceolata* it is the principal source of the medicinal senna leaves.

423. *C. alata*, Linn H. F.B.I., II. 264.

Syn. :—*Senna alata*, Roxb. 354.

Sans. :—Dadraghna.

Vern. :—Dád mardan, dád-mári (B.); dád murdan, dát-ká pát (Lt.); Dádamardana (Bom. and Mar.); Dát-ká-pata Viláyati-agati (Duk.); Shímai-agati, vandukolli (Tam.); Sima-avisl (Tel.); Shima-akatti (Mal.); Shime-agase (Kan.).

Habitat :—Met with in Lower Bengal and the Western Peninsula.

A large shrub, with very thick, finely downy branches. Leaves sub-sessile, 1-2ft. long. Leaflets 8-12 pair, oblong obtuse, 2-6in. long, minutely mucronate, rigidly sub-coriaceous, glabrous, or obscurely downy beneath, broadly rounded, oblique at the base. Rachis narrowly winged on each side of the face. Stipules deltoid, rigid, persistent, articulate, $\frac{1}{2}$ in. long. Flowers in short pedicels, in spiciform, pedunculate racemes; the buds in yellow caduceous bracts. Sepals obtuse; petals bright yellow, with darker veins, broad-ovate, 1 $\frac{1}{2}$ in. long. Stamens very unequal. Perfect stamens 7, the anthers subequal or those of 2-3 lowest larger than the others. Three posterior filaments without anthers. Pod long, ligulate with a broad wing down the middle of each valve, membranous. Dehiscent, straight and glabrous; 4-8 by $\frac{1}{2}$ - $\frac{3}{4}$ in. Seeds 50 or more.

Parts used :—The leaves.

Uses :—The leaves of this plant are regarded as an excellent medicine for ring-worm. They are also used in other skin diseases, and considered useful in snake-bites (Ainslie).

Internally, the leaves and flowers are prescribed as a tonic (T. N. Mukerji). The whole plant is used by the Tamul people as a remedy in venereal, poisoned bites, and as a general tonic (*Roxb*).

In eczema, I have obtained the best results by washing the parts repeatedly with a strong decoction of the leaves and flowers. The bark has the same properties. In cases of bronchitis and asthma, in herpetic constitutions, I have administered the decoction of the leaves and flowers in repeated doses during the day, relieving dyspnoeal oppression and promoting expectoration. The medicine acts on the bowels slightly and increases the secretion of urine (Dr. Amed, Ph. J.) (28-4-88).

The evidence collected by the authors of Ph. Ind. is strongly in favour of its efficacy in ring-worm. The best way to apply it is to bruise the leaves and mix them with lime juice, the paste thus prepared is spread upon the affected part. The leaves have also purgative properties (Dymock).

424 *C. glauca*, Lam, H.F.B.I., II. 265.

Syn. :—*Senna arborescens*, *Roxb*. 352.

Vern. :—Konda-tantepuchettu (Tel.); Wellia-tagera (Mal.).

Habitat :—From the Himalayas throughout India.

A large shrub or small tree, with spreading, grooved, more or less glabrous, branches. Leaves petioles 5-9in. long; rachis adpressed, grey-pubescent, with an erect, clavate gland between each of the 2 or 3 lower pair of leaflets. Leaflets 4-10 pair. Stipules $\frac{1}{2}$ - $\frac{1}{3}$ in. long, linear, acute, falcate, sub-persistent; leaflets broadly-ovate, obtuse, emarginate or subacute, the terminal pair largest, sub-coriaceous, green, glabrous above, glaucous and pubescent on the nerves beneath, sometimes slightly unequal-sided at base. Flowers yellow, in axillary corymbose racemes; shorter than the leaves. Bracts ovate, reflexed, caducous. Calyx yellow veined. Sepals broad-ovate, glabrous, outer two smallest. Petals broad-ovate, obtuse, with a short claw, veined

and pubescent on the outside. Stamens 10, perfect, subequal. Pod thin, flat, with raised lines between, dehiscent, glabrous, 4-8 in. long. "Seeds 20-30, smooth, compressed, narrow-oblong, dark-brown, shining, shallowly-pitted on the faces" (TALBOT).

Use :—The bark and leaves are prescribed in diabetes and gonorrhoea (Balfour).

425. *C. absus*, Linn. H.F.B.I., II. 265, Roxb 351.

Vern. :—Châkut, châksu, bânâr (H. & Duk.) ; Mulaippâlvirai, karnukâ-nam, kâttukkol, edikkol (Tam.) ; Chanu-pâlavittulu (Tel.) ; karin-kolla (Mal.) ; Châksie (Bom.) ; Kân-kuti (Mar.) ; Chimar or Chime, chinôl (Guz.) ; Chowun (Sind). Chaksoo (Pb.).

Habitat :—From the foot of the Western Himalayas to Ceylon.

An erect annual, 1-2 ft. high, with stem and leaves clothed with grey bristly viscid hairs. Leaves long-petioled. Leaflets oblong, very oblique, 1-2 in. long, obtuse, or subacute, 4 in. long, membranous. Stipules small, linear, persistent. Racemes narrow, equalling or exceeding the leaves. Sepals lanceolate, bristly, $\frac{1}{8}$ - $\frac{1}{5}$ in. Corolla reddish yellow, very small. Pod oblique, ligulate, 1-1 $\frac{1}{2}$ in. long, 5-6-seeded, the thin valves beset with bristly hairs.

Parts used :—The seeds and leaves.

Use :—Mahomedan writers describe the seeds as attenuant and astringent, and say they strengthen the sight when used as a collyrium. In some books a plaster made from the seeds is recommended as an application to wounds and sores, especially of the penis. In purulent ophthalmia about a grain of the powdered seeds, after being baked, is introduced beneath the eye-lids (Dymock).

The receptacle of the seed possesses diuretic and stimulant properties (Irvine, Patna).

Used as a cathartic in habitual constipation (dose $\frac{1}{8}$ -3 drams). Seeds are found efficacious in ring-worm (Watt).

426 *C. mimosoides*, Linn, H.F.B.I., II. 266.

Syn. :—*S. sensitiva* and *S. tenella*, Roxb. 355.

Vern. :—Patwa-ghâs (Santal).

Habitat :—The Himalayas.

A low, diffuse, perennial shrub, with slender, finely downy branches. Leaves 1-3in. long, with a solitary, sessile gland on the rachis below the leaflets; leaflets 60-100, linear, rigidly coriaceous, $1\frac{1}{8}$ in. long, obliquely mucronate, with the midrib close to the upper border; stipules large, linear-subulate, persistent. Flowers 1-2 together in the axils of the leaves, on short pedicels. Sepals $\frac{1}{8}$ in., lanceolate-acuminate, bristly. Corolla little exserted. Stamens 10, alternately long and short, rarely 5 of equal size? (K. R. K.). Pod strap-shaped, flat, dehiscent, $1\frac{1}{2}$ -2 by $\frac{1}{8}$ in., nearly straight, glabrescent or finely downy; Septa more or less oblique.

Hooker writes in Curtis' Botanical Magazine for December 1st, 1870 :—

"*Cassia mimosoides* is a rather common Asiatic or African tropical and sub-tropical plant, growing on dry banks, and presenting a beautiful appearance from the softness of its finely divided, bright green, feathery foliage, elegant habit, and the beauty of its golden flowers, which are abundantly produced and supported on Lair-like pedicels. Like so many tropical plants of wide distribution, it varies much,***"

Use :—The root is given for spasms in the stomach by the Santalis (Revd. A. Campbell, Santal, Watt II. 220).

427 *Cynometra rami flora*, Linn. H.F.B.I., II. 267.

Vern. :—Iripa (Mal.) ; Shing (B.) Irapu (Tam.).

Habitat :—The Western Peninsula and Malabar.

An evergreen, erect, unarmed tree. Bark smooth, wood brown red, hard, close-grained. Leaflets 1-2 pair, 1-3in. long, more or less coriaceous, 1-jugate and 2-jugate, mixed or often all 1-jugate, sub-sessilely oblong, subacute, very oblique, 3-6in.

long; petiole $\frac{1}{2}$ -1 $\frac{1}{2}$ in. Flowers small, numerous, fasciculate or in bracteate racemes, inflorescence in bud, enclosed in imbricate deciduous scales. Calyx-tube very short, segments 4 or 5, oblong. Petals 5, equal, stamens 10, rarely indefinite, anthers versatile. Ovary with 2 ovules. Pod turgid, very rugose, indehiscent, subsessile, with thick valves, $\frac{1}{2}$ -1in. long, seed generally 1, exalbuminous, filling the cavity of the tree pod.

Use:—The root is purgative. A lotion is made from the leaves boiled in cow's milk, which, mixed with honey, is applied externally in scabies, leprosy and other cutaneous diseases. An oil is also prepared from the seeds and used for the same purpose (Rheede).

428 *Hardwickia pinnata*, Roxb. H.F.B.I., II. 270
Roxb. 378.

Vern.:—Matâyen Samprâni (Travancore); Kolâvu (Tinnevely); Genu (Manjarabad).

Habitat:—The ghats of Kanara, Travancore and Carnatic.

A very large, unarmed tree. Wood moderately hard; sapwood large; heartwood dark-red, or reddish-brown, exuding a red, sticky resin. Leaves, abruptly pinnate, with few leaflets. Leaflets 4-6, alternate, petiolate, not oblique, oblong, rigidly coriaceous, acute, 2-4in. long, venulose, the upper of the uppermost pair sometimes apparently terminal; midrib central veining pinnate; petiolules $\frac{1}{6}$ - $\frac{1}{4}$ in. Panicles copious, axillary and terminal, formed of dense slender, cylindric racemes; pedicels spreading, $\frac{1}{24}$ - $\frac{1}{12}$ in. Calyx broadly campanulate, under $\frac{1}{12}$ in long, with a pair of minute adpressed bractioles. Filaments twice as long as the sepals. Stigma minute. Pod turgid, 1 $\frac{1}{2}$ -2in. long, obovoid or oblong, nearly or quite filled up by the seed, subglobose, rigid.

Use:—The balsam of *Hardwickia* has been used in India for gonorrhoea and with as much success as copaiba (Watt).—

The oleoresin of *Hardwickia pinnata* was steam distilled and 34 per cent. by weight of oil was obtained. The oil was very thick and its specific gravity

at 25°C was 0.0008, optical rotation in 100 mm. tube 8°18'. It gave the following fractions on being distilled in an ordinary flask.

				Fractions by volume.
Up to 200°C	...	...	...	... About 4 drops.
240°C	...	...	...	... 5 Per cent.
240—245°C	...	...	...	... 7 "
245—250°C	...	...	...	... 70 "
250—255°C	...	...	...	... 15 "
Above 255°C	...	...	...	... 3 "

It had no acid value. The iodine value (Hubl. 18 hours) was 232.67.

The constants of the oleoresin and the resin left behind after distillation are as follows :—

The preliminary composition of the *Hardwickia pinnata* oleoresin is :—

Oil per cent.	Resin per cent.	Moisture per cent. (by difference).
34.55	62.80	2.65

Its constants are :—

				Per cent.
Sp. Gr., at 24°C	...	...	...	... 1.019
Acid number	...	...	...	... 72.94
Saponification number...	...	...	...	... 231.50
Ester number	...	...	...	... 158.56
Iodine (Hubl. 18 hours)	...	...	...	... 159.15

The resin which forms about 63 per cent. of the sample under reference gave the following constants :—

Sp. Gr., at 25°C	...	...	...	... 1.098
Acid number	...	...	...	... 144.27
Saponification number...	...	...	...	... 306.60
Ester number	...	...	...	... 162.33
Iodine value (Hubl. 18 hours)	...	...	...	... 88.01

The oil, as reported by the Imperial Institute, London, cannot be substituted for copaiba oil. The enquiry as to the uses of the oil and the resin has so far given negative results.

Annual Report of the Board of Scientific Advice for India for the year 1914-15, p. 16.

429 *Saraca indica*, Linn., H.F.B.I., II. 271.

Syn. :—*Jonesia Asoka*, Roxb. 312.

Sans. :—Asoka.

Vern. :—Asok (H. & B.); Aseka (Cuttack); Ashunkar (Kan.); Jássoondi, asoka (Bomb.).

Habitat :—Central and Eastern Himalayas, Kumaon, East Bengal and South India.

A large, erect evergreen tree. Wood light reddish-brown, soft. Occasional faint, brown concentric belts of soft tissues. Young shoots drooping and beautifully light to deep crimson. Leaves sessile or subsessile; leaflets 3-6 pair, oblong or oblong-lanceolate, acute or obtuse, 3-9in. long, rigidly sub-coriaceous. Flowers in dense corymbs, 3-4in. diam., orange on expanding, gradually turning bright scarlet. Peduncles and pedicels glabrous, coloured. Pedicels stout, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, below the oblong-spathulate, ascending, amplexicaul bracteoles. Sepals $\frac{1}{4}$ - $\frac{1}{2}$ in., obovate-oblong. Calyx-tube, $\frac{1}{2}$ in. long, twice the length of lobes. Perfect stamens 7-8. Filaments thrice as long as the sepals. Pod 6-10 by 2in., valves hard, reticulate. Seeds 4-8, oblong, compressed, $1\frac{1}{2}$ in. long.

Use :—The bark is much used by Hindu practitioners in uterine affections and especially in menorrhagia. A decoction of the bark in milk is generally prescribed (Dutt).

Dr. Waring says that it proved useful in a recurring hæmorrhoidal tumour in a member of H. H. the Maharajah of Travancore's family (*B. M. J.* and *I. M. G.*, 1885, p. 260). Flowers pounded and mixed with water are used in hæmorrhagic dysentery (Watt).

430. *Tamarindus indica*, Linn., H.F.B.I., II. 273, Roxb. 530.

Sans. :—Tintidi; Amlika.

Vern. :—Amlī; imli (H.); Tentul (B.); Amlī; Chintz (Bomb.); Poolie (Tam.); Balam Poolie (Mal.); Chinta-chettu (Tel.); Karangi (Mysore).

Habitat :—Cultivated throughout India, as far north as the Jhelam.

A large, evergreen, unarmed tree. Bark $\frac{1}{2}$ in. thick, dark grey, with longitudinal fissures and horizontal cracks. Wood hard, close-grained; sapwood yellowish white, sometimes with

red streaks; heart-wood with an irregular outline, and radiating ramifications, very durable. Leaves abruptly pinnate, with 20-40, glabrescent, close, obtuse, opposite, oblong leaflets. Racemes copious, lax at the end of branchlets, with 10-15 flowers together. Pedicels articulated at the base of the Calyx. Bracts boatshaped, enclosing buds, caducous. Calyx-tube turbinate, segments 4. Petals 3, under $\frac{1}{2}$ in. long, unequal, variegated with red and yellow, the 2 lower reduced to scales, perfect stamens 3, filaments united to the middle of the anthers, oblong, versatile. Ovary stipitate, the stalk adnate to Calyx-tube. Pod thick, filled when mature with dark brown acid pulp transversed by fibres. 3-8 in. long, 1 in. or more broad, 3-10-seeded. Seeds brown, shining, without albumen, the outer coat producing abundant mucilage, when steeped in water for a time.

Most authors make two species of *Tamarindus*, the Indian kind, with long pods, and the West Indian, with short pods; but even those who adopt this view of the subject generally raise a question of their specific identity. India is probably the aboriginal country of both, whence the species was introduced into West Indies. Even in the East the Tamarinds of the Archipelago are considered the best of those of India. The Arabs called the tree *Tamr-i-hindee*, or Indian Date, from which has been derived the generic name, *Tamarindus*. The inhabitants of the East have a notion that it is dangerous to sleep under the tree, and it has been remarked, as of our Beech in Europe, that the ground beneath is always bare, and that no plant seems to thrive under its branches.*

In the East, the pulpy fruits of the Tamarind are preserved without sugar, being merely dried in the sun and cured in salt. In the West Indies, the pulp is usually packed in small kegs between layers of sugar, and hot syrup is poured on the whole. In order to enable them to keep without fermentation for a length of time, the first syrup, which is very acid,

**Apropos* of this remark it may here be observed that the Bhangi or sweeper of the Santa Cruz Station, B. B. and C. I. Railway, has his sleeping hut under a group of 5 or 6 tamarind trees, huge and shady, where for the last 20 years the hut has been in use (K. R. KIRTIKAR).

is poured off and a second is added. A very excellent preserve is imported from Curacao, made from the unripe pods, preserved in sugar, with the addition of spices. (Curtis' Botanical Magazine for February 1st, 1851).

Use :—The ripe fruit is regarded as refrigerant, digestive, carminative and laxative, and useful in diseases supposed to be caused by deranged bile, such as burning of the body, costiveness, intoxication from spirituous liquors or dhatura, &c. The shells of the ripe fruit are burnt and their ashes used in medicine as an alkaline substance, along with other medicines of the sort. The pulp of the ripe fruit, as well as a poultice of the leaves, is recommended to be applied to inflammatory swellings (Dutt's Hindu Materia Medica). Mahomedan physicians consider the pulp to be cardiacal, astringent and aperient, useful for checking bilious vomiting, and for purging the system of bile and adust humors; when used as an aperient, it should be given with a very small quantity of fluid. A gargle of Tamarind water is recommended in sore-throat. The seeds are said to be a good astringent; boiled, they are used as a poultice to boils; pounded with water they are applied to the crown of the head in cough and relaxation of the uvula. The leaves crushed with water and expressed yield an acid fluid, which is said to be useful in bilious fever and scalding of the urine; made into a poultice, they are applied to reduce inflammatory swellings, and to relieve pain. A poultice of the flowers is used in inflammatory affections of the conjunctiva; their juice is given internally for bleeding piles. The bark is considered to have astringent and tonic properties (Dymock).

Analysis was made of the entire seeds, and also of the kernel without the brown covering. They had the following composition :—

			Seeds.	Kernels.
Water	...	...	10.50	9.35
Albuminoids	...	...	13.87	18.06
Fat	...	...	4.50	6.60
Carbohydrates	...	...	63.22	62.88
Fibre...	...	...	5.36	.66
Ash	...	...	2.55	2.45
			100.00	100.00
Nitrogen	...	...	2.22	2.89
Phosphoric anhydride	...	...	.40	.55

There is a decided difference in the composition of the shelled and unshelled seeds. The shells contain the undesirable constituents, namely, the tannin matter and fibre, and the kernels represent a nutritious food, white in appearance and with no disagreeable odour and taste.

The oil obtained by ether is thick and light yellow in colour. It solidifies at 15° C., and gave the following constants:—

Acid value ...	...	...	...	0.84
Saponification value ...	...	...	...	183°
Iodine value ...	...	...	...	87.1
Fatty acids ...	...	...	...	94.9
Melting point ...	...	...	...	46°

The fatty acids crystallised twice from alcohol afforded an acid melting at 74°5, resembling arachidic acid of ground-nut.

Elaidin reaction gives a buttery consistence. The oil is semidrying, forming a skin only after 12 days. (*Agricultural Ledger*, 1907, No. 2 pp. 15-16.)

431. *Bauhinia tomentosa*, Linn., H.F.B.I., II. 275; Roxb. 345.

Vern.:—Kachnâr (H.); Kanchani (Tam. and Tel.) Asundro (Guz.); Châmal (Konkan); Pivalâkâchan, Âptâ (Mar.); Esamaduga (Madras). "The vernacular names Kachnâr, Kâchan, applied to more than one species of *Bauhinia*" (MOODEEN SHERIFF).

Habitat:—N. W. Provinces to Ceylon.

An erect large shrub, with downy branches. Leaf broader than long, not cordate, coriaceous, 1-3 in. long, pubescent beneath, divided one-third down into two rounded lobes, 7-nerved. Flowers in pairs, on short, usually leaf-opposed peduncles, bracteoles linear. Calyx spathaceous, lin. long, shortly trifid at top, pubescent. Petals sulphur-yellow, the uppermost with a dark purplish blotch at base, 1½ in. long, not spreading, but forming a bell-shaped Corolla. Fertile stamens 10. Style ½-¾ in. Pod dehiscent, finely pubescent, distinctly stalked, 4-5 by ½-¾ in., 6-10-seeded, glabrous; seeds small.

Use:—The bruised bark is externally applied on tumors and wounds (T. N. Mukerjee). The native practitioners in Southern India prescribe the small dried buds and young flowers in dysenteric affections (Ainslie). On the Malabar Coast, a decoction of the root bark is administered in inflammation of the liver (Rheede). The decoction of the root bark is also used as a vermifuge (Surg. Hill, Manbhum).

Applied locally in apthæ. The fruit is diuretic; an infusion of the bark is used as an astringent gargle. The seeds made into a paste with vinegar are said to be efficacious as a local application to wounds inflicted by poisonous animals (DR. EMERSON).

432. *B. racemosa*, Sam. Dict. I. 390; H.F.B.I., II. 276, Roxb. 345.

Syn.:—*B. parviflora*, Vahl.

Sans.:—Svetakānchan.

Vern.:—Kachnāl, gūrial, thaur, astha, makkūna, manla, dhorāra, marvil, ghila (H.); Banraj, banraji (B.); Kaimu (Kol.); Beriju (Santal.); Ambhota (Uriya); Manla, dhorāra (C. P.); Kosūndra, taur (Pb.); Astra, bosha (Gond.); Jhinja (Ajmere); Amba bhōsa (Bhil.) Are-kā-jhār (Duk.); Areka, are-maram (Tam.); Ari, āre, adda (Tel.); Apta, apatā, Wanrāja, Seyāra (Mar.); Supta (Kan.).

Habitat:—Met with in the Sub-Himalayan tract, in the Punjab, Oudh, Bengal, Central and South India.

A small, crooked, deciduous, bushy tree. Bark $\frac{1}{2}$ in. thick, blackish, very rough, with deep vertical cracks. Wood brown, hard, with irregular dark patches near the centre; in alternate concentric wavy band of dark hard and pale soft tissue, of nearly equal widths, the soft bands anatomosing (Gamble). Branches drooping. Leaves broader than long, small, deeply cleft, 7-9-nerved, rigidly coriaceous, lobes rounded, clothed more or less densely beneath with grey pubescence. Racemes short-peduncled, lax, terminal and leaf-opposed, $\frac{1}{2}$ - $\frac{1}{2}$ ft. long, with densely grey downy rachises; pedicels $\frac{1}{2}$ - $\frac{1}{2}$ in.; erecto-patent. Calyx-tube turbinate, not more than $\frac{1}{12}$ in. long; limb $\frac{1}{4}$ - $\frac{1}{2}$ in. not splitting up. Petals oblanceolate, yellow (J. G. Baker), as long as the Calyx-limb, unequal. 'Flowers small, white,' says Brandis. Pale-white, says Kanjilal. Stamens 10, all perfect, united at the base. Filaments and anthers with long hairs. Stigma sessile. Pod thick, generally curved, 4-12 in. long, $\frac{1}{2}$ in. broad, not venulose, falcate, firm, glabrous, turgid, stalk above an inch long. Seeds 10-20.

Parts used:—Gum and leaves.

Use:—A decoction of the leaves is used to allay headache in malarious fevers (Dymock). The gum is used medicinally in South India (I. L. STEWART).

433. *B. retusa*, Ham. H.F.B.I., II. 279, Roxb. 345.

Vern.:—Kandla, kanalla, kuyral, gwayral; Semla (H.); Kurāl (Pb.); Laba (Kol.); Thaur (Gond.); Nirpa (Tel).

Habitat:—N. W. Himalaya, from the Beas eastward, ascending to 4,500ft; Central India.

A middle-sized, deciduous, erect tree. Bark $\frac{1}{2}$ in. thick, dark brown, with vertical cracks, often much scored by the cut of gum-collectors. Wood red, with irregular dark-red or black patches and streaks near the centre, hard, having pale bands or soft tissue, which alternate with dark bands of firmer texture. Branchlets long, slender, pendulous. Leaves round-cordate, cleft only at the very tip; coriaceous, broader than long, 3-8 in. across, 9-11-nerved, glabrous beneath. Flowers numerous, in pedunculate corymbose racemes, forming long terminal panicles, sometimes 1 ft. long, clothed with fine, grey, silky, pubescence, the lower corymbs springing from the axils of reduced leaves. Pedicels long, slender, lower ones ascending, $\frac{1}{2}$ - $\frac{3}{4}$ in. long. Bracts and bracteoles minute, caducous. Calyx-limb splitting into 2 or 3 segments $\frac{1}{2}$ in. long. Bud ovoid. Petals oblong, clawed, hairy outside, blade orbicular, pale-yellow, marked with dark purple veins. Fertile stamens 3; style produced, stigma large. Pod late-dehiscing, 4-6 by lin., generally broader at top, glabrous. Seeds 6-8.

Use:—The gum is used as an external application to sores. It is considered as an emmenagogue and diuretic by some native practitioners (DR. EMERSON).

434. *B. Vahlîi*, W. and A. Prodr. 297; H.F.B.I., II. 279.

Syn.:—*B. racemosa*, Vahl., Roxb. 346.

Vern.:—Taur (Pb.); Malghan, maljan, mahi, marraim, jallaur (H.); Chehur (B.); Sihâr, maul mahalan (C. P.); Borla (Nepal); Shioli (Uriya); Adda (Tam.); Chamboli, Chambuli. (Dec.);

Sungungrik (Lep.); Jom. (Santal.); Lama, rung (Kol.); Cham-bûra, chambûl (Mar.); Pair, bela (Gond.).

Habitat:—Foot of the Central and East Himalayas, Behar, Concan, and Sircars.

A gigantic, climbing tree. Stem irregularly ridged and furrowed, often 100ft. long and 2ft. diam. Bark brown, horizontally waved, wood porous, in broad, irregularly broken, but concentrically arranged, masses with a palmate outline, alternating with red, juicy bast tissue (Gamble). Branchlets, tendrils, petioles, underside of leaves and inflorescence clothed with dense ferruginous, rarely grey, tomentum. Leaves deeply cordate, variable in size, often up to 18in. diam., cleft to about $\frac{1}{3}$ of their length, lobes obtuse, basal nerves 11-15, petiole stout, tendrils axillary, often flower-bearing, forked, bifurcations circinate. Flowers creamy-white, on long, slender pedicels, in terminal corymbose racemes. Calyx-tube shorter than the 2-lobed limb. Petals densely hairy, much exserted, 1-1 $\frac{1}{4}$ in. long. Stamens fertile, 3. Ovary hairy. Pod flat, woody, clothed with dense brown felt, 9-18 by 2-3in., bursting open with a loud report. Seeds 8-12.

Use:—The seed possesses tonic and aphrodisiac properties. Leaves are demulcent and mucilaginous (WATT).

435. *B. purpurea*, Linn., H.F.B.I., II. 284, Roxb. 344.

Sans.:—Kâncan.

Vern.:—Kaniâr, kandan, koliâr, khairwâl, kwillar, koilari, sona (H.); Koiral, karâr, karalli, grey (Pb.); Deva Kâncan, rakta kâncan, koiral (B.); Khwairalo (Nepal); Kachic (Lepcha); Buruju (Kol.); Singyara (Santal); Kodwari (Gond); Rakta chandan, atmatti, ragta kâncan, deva kâncana (Mar.); Penya âre, mandareh (Tam.); Peddaôre, bôdanta-chettu (Tel); Sarûl, sural, kanchivâla (Kan.).

Habitat:—From the foot of the West Himalayas and Khasia Mountains to Ceylon.

A moderate-sized, evergreen, bushy tree, with moderately stout, glabrescent branchlets. Bark about $\frac{1}{2}$ in. thick, ash-

coloured to dark brown. Wood pinkish white, turning dark-brown on exposure, moderately hard; wavy concentric bands of soft tissue alternating with darker coloured bands of firm tissue. Leaves 3-6 in. long, rather large than broad, sometimes overlapping at the inner margins; petiole 1-1½ in. long. Flowers deep-rose in paniculate or corymbose racemes; pedicels ½-¾ in. long, tomentose; buds obovoid or oblong, acute, strongly 5-ribbed. Calyx-tube ¾-1 in. long. Limb nearly twice as long, slit on one-side, 5-toothed at the apex. Petals reddish, 1½-2 in. long, oblanceolate, clawed, with a distinct midrib and fine straight lateral veins. Stamens usually 3, fertile, slightly shorter than the petals; staminodes filiform, of varying lengths, oblique. Pod 6-10 in. by ¾-1 in., on a tomentose stipe, ¾-1 in. long, thick pointed, slightly falcate, greenish-purple, pubescent along the sutures, late in dehiscing. Seed 12-15 (KANJILAL).

Parts used :—The bark, root and flowers.

Uses :—The bark or root and flowers mixed with rice water, used as a maturant for boils and abscesses (T. N. Mukerji). A decoction of the astringent bark is recommended as a useful wash in ulcers (U. C. Dutt). The bark acts as an astringent in diarrhoea (Barren). The root carminative; the flowers laxative. (WATT).

436. *B. variegata*, Linn., H.F.B.I., II. 284, Roxb. 344.

Sans. :—Kovidâra; Kanchanâra.

Vern.—Kachnâr, koliâr, kurâl padrian, khwairaal, guriâl, gwiâr, bariâl, kaniâr, kândan, khairwâl (H.); Rakta-kâncan (B); Kurmang (Mehi.); Singya (Kol.); Jingya (Santal); Taki (Nepal); Rba (Lepcha); Kanchan, ragtâ kâncan (Mar.); Kâncan (Concan); Kovidâr (Bomb.); Segapu-munthari (Tam.); Kanchivalado (Kan); Borara (Uriya).

Habitat :—From the foot of the Western Himalayas and Sikkim, throughout India.

A middle-sized, deciduous, erect tree, with moderately stout, glabrescent branchlets. Bark grey, with vertical cracks. Wood greyish-brown, with irregular patches of harder and darker

wood in the centre, moderately hard ; alternate, more or less concentric, wavy, broken and anastomosing bands of dark firm tissue, and slightly lighter soft tissue. Leaves rather broad than deep, middle-sized, rigidly sub-coriaceous, deeply cordate, the obtuse lobes reaching $\frac{1}{4}$ - $\frac{1}{3}$ down ; 11-15-nerved ; pubescence grey. Corymbs few-flowered, lateral, sessile, or short peduncled ; bracts minute, deltoid ; pedicels erecto-patent, $\frac{1}{4}$ - $\frac{1}{2}$ in. Calyx-tube $\frac{3}{4}$ -1 in ; limb cordate-ovate, equalling the cylindrical tube. Petals $1\frac{1}{2}$ -2 in. long, an inch or more broad, white, beautifully variegated with red and yellow, glabrous, obovate, clawed, much exserted. Stamens 3-5. Pod $\frac{3}{4}$ -1 in. broad, hard, flat, rather decurved, dehiscent, 10-15-seeded.

Parts used :—The bark and root.

Use.—The Sanskrit writers mention two varieties of this *Banhinia*—the one with purple or deep, rose-colored flowers, and the other with white, yellow or green. The bark is described as alterative, tonic and astringent. Useful in scrofula, skin diseases and ulcers (Dutt). The author of the *Makhzan*, describes the bark as astringent, attenuant and tonic. He says it is used to check diarrhœa, to remove intestinal worms, and prevent the decomposition of the blood and humors ; on this account it is useful in leprosy and scrofula. A gargle made from the bark with the addition of *Akâkiâ* (extract of *Acâciâ* pods) and pomegranate flowers is mentioned as a remedy in salivation and sore-throat, and a decoction of the buds in cough, bleeding piles, hæmaturia and menorrhagia (Dymock).

In the Concan the juice of the fresh bark with the juice of the flowers of *Strobilanthes citrata*, 10 tolâs of each, is given as an expectorant, and the bark is used with ginger as an internal remedy for scrofula. (Dymock.)

The root in decoction is given in dyspepsia and flatulency ; the flowers with sugar as a gentle laxative ; and the bark, flowers, or root triturated in rice water as a cataplasm to promote suppuration (Watt). The dried buds are used in piles and dysentery. They are considered by natives cool and astringent, and are useful in diarrhœa and worms (Punjab Products.)

437. *Neptunia oleracea*, Lour., H.F.B.I., II. 285, Roxb. 420.

Vern :—Pâni-najak ; pani-lâjak (B.) ; Laj-alu (Patna) ; Panilajak (Bomb.) ; Sunday-kiray (Tam.) ; Niru-tal-vapu, nidrayung (Tel.) ; Nitti-todda-vaddi (Malay.).

Habitat :—In tanks, throughout the greater part of India.

An annual herb, without prickles, stout, wide-creeping, rarely throwing out suberect branches ; producing copious fibrous rootlets from the same nodes that bear the leaves and penduncles. Stems almost entirely prostrate. Leaves bipinnate, with persistent stipules and numerous small strap-shaped, sensitive, membranous leaflets. Pinnæ 4-6, 2-3 in. long. Rachis glandless ; leaflets glabrous, obtuse, 16-30, $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Peduncles ascending, $\frac{1}{4}$ -1 ft. ; bracts small ovate, sub-obtuse. Sterile flowers numerous. Stamines $\frac{1}{4}$ - $\frac{1}{2}$ in., strap-shaped, yellow. Corolla $\frac{1}{2}$ in. Pod oblique, oblong, $\frac{1}{2}$ -1 in. long, rostrate, dry, soon dehiscent by the upper suture, 6-10-seeded.

Use :—Used as refrigerant and astringent (Irvine.)

438. *Entada scandens*, Bth., H.F.B.I., II. 287.

Syn. :—Mimosa scandens, Linn., Roxb. 420.

Vern. :—Gila-gach (B.) ; Gârbi, kârdal, khairi (B.) ; Gârambi, gardul (Bomb.) ; Geredi (Uriya) ; Pangra (Nepal) ; Taktokhejem (Lepcha) ; Parinkaka-vully (Mal.).

The seeds ; Pitpâpra (Bomb.).

Habitat :—Central and Eastern Himalayas, Nepal, Sikkim, and Western Peninsula.

A very large, woody climber, stems angled and much twisted spirally. Dark-brown, rough. Wood dark brown when dry, in alternate layers of woody and bark tissue. Brandis describes the wood structure more accurately thus :—"The wood to a great extent consists of thin walled parenchyma, in which are embedded longitudinal strands of vessels, sieve-tubes, and wood fibres." Leaves tripinnate, common petioles ending in long, woody, bifid tendrils ; pinnæ stalked opposite, two

pair; leaflets 3-4 pair, 1-2in. long, glabrous, shining, oblong or obovate, obtuse or acute, rigidly coriaceous. Flowers $\frac{1}{2}$ - $\frac{1}{3}$ in. long, pale yellow, crowded in long slender spikes from the axils of the upper leaves, or arranged in terminal panicle. Spikes peduncled, $\frac{1}{2}$ ft. long or more, usually panicle from the nodes of old leafless branches. Pedicels short, or absent. Calyx shortly 5-toothed; petals 5, stamens free, 10, exserted, anthers tipped with glabrous, deciduous glands. Pods woody, 2-4ft., or more by 4-5in., curved, constricted between the seeds, consisting of 10-30, one-seeded, flat, square or nearly orbicular joints, the valves thick, separating from the thick rim. Seeds 2in. broad, flat, nearly orbicular, brown, shining, testa hard. The seeds are eaten after being roasted.

Uses:—The kernel of the seeds is employed by the Hill people as a febrifuge. In Java, employed as emetic (DRURY).

An infusion of the spongy fibres of the trunk is used with advantage for various affections of the skin in the Philippines. (Dalzell and Gibson). The seeds are used in pains of the loins and debility (WATT).

The properties of the seeds do not appear to have been tested in European practice (DYMOCK).

Powdered kernel, mixed with some few spices, is commonly taken by native women for some days immediately after delivery, for allaying the bodily pains and warding off cold (WATT).

Crude saponin was extracted from the seeds after removal of the fat by means of 90 per cent alcohol, and precipitated by ether from the cold alcoholic extract. By precipitation with barium hydroxide solution, a saponin, named "Saponin A" was removed from the aqueous solution of this crude saponin. The solution thus freed from "Saponin A" was evaporated to dryness, after removing the excess of barium hydroxide, the dry residue extracted with hot 90 per cent. alcohol, and the alcoholic solution fractionally precipitated with chloroform and ether. The aqueous solution of the ether precipitate was dialysed, and the residue evaporated to dryness *in vacua* over sulphuric acid. "Saponin B" $C_{15}H_{22}O_{10}$ was thus obtained as a whitish hygroscopic powder, which became brownish on heating to 110 °C. It was precipitated from strong aqueous solutions by basic, but not by normal lead acetate. It gave a dark reddish-violet color, with strong sulphuric acid, eventually turning brown. On hydrolysis, a sugar identical with galactose, a sapogenin soluble in ether and in alcohol, and another body insoluble in those solvents and in ammonia, were formed.—J. S. Ch. I. 16-5-1904, p. 502.

439. *Adenanthera pavonina*, Linn., H.F.B.I., II. 287, Roxb. 360.

Sans.:—Koochandana; Kambhoji.

Vern.:—Rakta-chandan, rakta kambal, ranjan (B.); Vâl, thorali gunj (Bomb.); Manjadi; Anigundumani (Tam.); Bandigurvina; Manseni kotta (Tel.); Bir-mungara (Santal.); Manjati (Mal.); Bâri-gumchi, hati-gumchi (Duk. and Guz.); Manjadi (Kan.); Chandar (Assam.).

Habitat:—East Himalayas and Western Peninsula.

A deciduous, erect tree, without spines or tendrils. Leaves ample, bipinnate. Bark-grey. Wood hard, close-grained, pinnæ 8-12, opposite, short stalked, 4-8 in. long. Leaflets oblong, or elliptic-oblong, evenly alternate, short-stalked, not coriaceous, 12-18, obtuse, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long. Racemes short-peduncled, 2-6 in. long, $\frac{1}{2}$ in. broad, simple from the axils of the leaves and panicked at the end of the branches. Flowers fragrant. Pedicels as long as the flowers, $\frac{1}{8}$ - $\frac{1}{6}$ in. Calyx small, campanulate, teeth short. Petals 5, connate at base. Stamens 10, free, anthers tipped with a deciduous gland. Pods linear, 6-9 by $\frac{1}{2}$ in., falcate, curved and twisted when opening. Seeds 10-12, usually bright scarlet, con-colourous, shining, lenticular, compressed, rarely yellow-brown.

Use:—The powdered seeds make a useful external application, hastening suppuration.

A decoction is made from the leaves in South India, and given as a remedy for chronic rheumatism and gout. If used for any length of time, it is said to be an aphrodisiac. This decoction is said to be useful in hæmorrhage from the bowels and hæmaturia.

440. *Prosopis spicigera*, Linn., H.F.B.I., II. 288.

Syn.—*Adenanthera aculeata*, Roxb. 361.

Vern.—Shami (B. and M.); Jhand, khar (Pb.); Sâmi, sâmadâ, kandi (Sind.); Semru, kamra (Guz.); Pirumbe, jambu (Tam.) Chanee (Tel.)

Habitat :—Punjab, Sind, Rajputana, Guzerat, Bundelkhand and the Deccan.

A moderate-sized, thorny tree, with slender grey branches. Bark $\frac{3}{4}$ -1 in. thick, grey, rough, with deep longitudinal fissures and horizontal cracks. Wood very hard. Sapwood large, whitish, perishable; heart-wood purplish-brown. Branches and branchlets armed with scattered, broad-based, $\frac{1}{8}$ - $\frac{1}{4}$ in. long, conical prickles. Leaves bipinnate, pinnæ and leaflets opposite, pinnæ 2, 1-2 in. long; leaflets 7-12 pair, sessile, $\frac{1}{4}$ - $\frac{1}{2}$ in., ligulate, grey, glabrous, rigidly coriaceous, caducous. Flowers in short, pedicelled, axillary spikes, 2-3 in. long and terminal panicles. Corolla $\frac{1}{2}$ in. long. Stamens 10, free, exserted, anthers gland-tipped. Pod coriaceous, indehiscent, pendulous, linear, 5-10 in. long, filled with a dry sweetish pulp, contracted between seeds. Seeds 10-15, dull, brown, oblong.

Use :—The pod is considered astringent in the Punjab (STEWART).

The bark is used in the Central Provinces as a remedy for rheumatism (WATT).

441. *Dichrostachys cinerea*, W. and A. H.F.B.I., II. 288.

Syn. :—*Mimosa cinerea*; Linn. *Roxb.* 422.

Sans. :—Viravriksha.

Vern. :—Vartuli (H.); Kanlai, kunrat, kheri (Mhairwara); Khen (Raj.); Segum kâti (Mar. and Gond.); Vadatalla, vadatara (Tam.); Veturu, yeltu (Tel.).

Habitat :—N. W. Provinces; Western Peninsula.

A thorny, much-branched shrub or small tree. Bark grey or light brown, very thin, deeply fissured vertically, peeling off in thin flakes. Heart-wood red, streaked with black, extremely hard (Gamble). Spines axillary, strong, straight, sharp, often bearing leaves. Leaves bipinnate, $1\frac{1}{4}$ -2 $\frac{1}{2}$ in. long. Stipules subulate from a narrow base, pinnæ 4-10 pair, with stipitate

glands between each along the hairy rachis. Leaflets 12-15 pair, minute, puberulous, sessile, $\frac{1}{10}$ in. long, linear-oblique, closely set, acute at the apex. Flowers crowded, in short, dense axillary spikes, the upper flowers of each spike bisexual, yellow, the lower sterile, white or purple, with long filiform staminodes, $\frac{1}{2}$ in. long. Calyx minute, membranous. Corolla 3 times as long as the Calyx, $\frac{1}{10}$ in. long. Pod 2-3 in. by $\frac{1}{4}$ - $\frac{2}{3}$ in., dark-brown; irregularly twisted, 6-10 seeded; seeds obovoid, compressed, glabrous, indehiscent, opening irregularly.

Use:—The young shoots are bruised and applied to the eyes in cases of ophthalmia (AINSLIE).

442. *Mimosa pudica*, Linn., H.F.B.I., II. 291, Roxb. 423.

Sans.:—Vārāhkrānta, lajjalu.

Vern.:—Lajālu (H.); Lajak (B.); Lājwanti (Kumaon); Lajri (Mar.); Total-vadi (Tam.).

Habitat:—Throughout the hotter parts of India, the cultivated and found in the waste lands of the Dûn. Flowers in Dûn in August and September. Fruits in November and December.

Sensitive shrubby herb, with stem and rachis copiously bristly and prickly. The copious bristly hairs of the branchlets and petioles deflexed, those of the leaf rachis ascending. Rachis 1-1 $\frac{1}{2}$ in. long. Leaves digitate. Pinnæ of the leaves 3-4, nearly sessile, 2-3 in. long; leaflets 24-40, glabrous, sub-coriaceous. Flowers in small, peduncled, bright-pink heads all down the branches, 1-2 from each axil. Pod small, $\frac{1}{2}$ - $\frac{1}{4}$ in. long; sensitive, with very abundant straw-coloured weak prickles from both sutures, as long as the breadth of the pod. Flowers and fruits all through the year in garden, when cultivated.

Use:—Mir Mahommed Husain (the author of the Makhzan) tells us that it is much valued as a medicine by the Indians, and is considered to be resolvent alterative, and useful in diseases arising from corrupted blood and bile. The juice is also applied externally to fistulous sores (DYMCK).

A decoction of the root of this plant is considered on the Malabar Coast to be useful in gravellish complaints. The Vytians of the Coromandel side of India, prescribe the leaves and

root in cases of piles and fistula; the first are given in powder, in a little milk, to the quantity of two pagodas* weight or more during the day (AINSLIE).

In the Concan, the leaves are rubbed into a paste and applied to hydrocele; and their juice, with an equal quantity of horses' urine, is made into an *anjan*, used to remove films of the conjunctiva by setting up an artificial inflammation (Dymock).

The juice of the leaves is used to impregnate cotton wool for a dressing, in any form of sinus (CALTHROP).

443. *M. rubricaulis*, Lam. H.F.B.I., II. 291.

Syn.:—*M. mutabilis*, Roxb. 423.

Vern.:—*Agla-agl*, kingli, kacheyta (H.); Râl, rianb, didriâr, arlu, alla, kikri (Pb.); Hajern (Sind.); Aradi (Nepal.); Sibriû (Lepcha); Chilatti (Bhil.); Shia-kanta, kuchi-kânta (B.); Sega janum (Santal.); Allâ (Raj.); Hujiru (Sind.); Bida, chandra, undra, ventra (Tel.).

Habitat:—Western Himalaya, Kumaon, westward to Mishuir and Bhotan, and through India Proper.

A large, straggling, prickly, pubescent shrub or small tree. Bark grey. Wood hard, sapwood yellowish white, heart-wood red. Branches, petioles and peduncles, armed with short, curved, sharp yellowish prickles. Stem attaining 5in. diam. Leaves bipinnate, 5-7in. long; stipules $\frac{1}{4}$ in. long, setaceous; pinnæ 5-12 pair, shortly stipulate; the rachis without prickles; leaflets 6-12 pair, membranous, $\frac{1}{4}$ - $\frac{3}{8}$ by $\frac{1}{8}$ in., obliquely-oblong, shortly cuspidate, glabrous above, slightly pubescent beneath; midrib excentric; petiolules very short. Flowers 4-merous, pink, in fascicled, axillary, pedunculate heads; peduncles 1-2in. long, slender, pubescent, crowded at the ends of the branches; bracts small, setaceous. Calyx minute ciliolate. Corolla $\frac{1}{8}$ in. long, shortly 4-lobed. Stamens 8, long-exserted. Ovary stalked, glabrous. Pod 3-4in. by $\frac{1}{2}$ in., stipitate glabrous, falcate, separating in 4-10 1-seeded joints from the sutural frame which is usually without prickles (TALBOT).

Use:—In Chamba, the bruised leaves are applied to burns, and the fruit is also officinal (STEWART).

* A Pagoda weighs 54 grains.

The leaves are prescribed as an infusion for piles in the N. W. P. (Atkinson).

In Chutia Nagpur, the powdered root is given when from weakness the patient vomits his food; the fruit and leaves are also used medicinally (REVD. A. CAMPBELL).

444. *Acacia Farnesiana*, Willd., H.F.B.I., II. 292.

Syn.:—*Mimosa farnesiana*, Linn. *Roxb.* 421.

Vern.:—Vilāyati kīkar, Vilāyati bābūl, Gu-kīkar (H.); Guya bābla (B.); Vedda vala, Piy-Velam (Tam.); Pivelam (Mal.); Piyi-tumma, Kampu-tumma, Naga-tumma (Tel.); Jali (Kan.); Gūi-bābhul (Mar.); Talbaval (Guz.); Kue bāwal (Sind.)

Habitat:—Himalayas to Ceylon.

A thorny shrub. Bark light brown, rough. Wood hard, close-grained; sapwood white; heart-wood irregular. Branches striate, glabrous, curved with pale-brown lenticels. Stipular spines white, straight, $\frac{1}{4}$ – $\frac{3}{4}$ in. long, hard, sharp, divaricate. Leaves bipinnate; rachis 1–2 in. long, angular, pubescent, with a small raised gland about the middle of the petiole; pinnæ 4–8 pair, $\frac{3}{4}$ – $1\frac{1}{4}$ in. long; leaflets 10–20 pair, $\frac{1}{2}$ – $\frac{1}{4}$ by $\frac{1}{12}$ – $\frac{1}{20}$ in., linear, acute, glabrous, sessile; base rounded, oblique. Flowers bright-yellow, powerfully sweet-scented, in globose fasciculate heads $\frac{1}{4}$ in. diam.; peduncles $\frac{3}{4}$ –1 in. long, on axillary nodes with a ring of small membranous bracts near the middle or close to the flowers. Calyx campanulate, very minute. Corolla 1 in. long; lobes short, triangular. Pod nearly cylendric pointed at the ends, 2– $3\frac{1}{2}$ in. long, by $\frac{1}{2}$ in. broad glabrous, brown, veined, indehiscent. Seeds in 2 series, embedded in dry, spongy tissue (Talbot).

Use:—The bark is astringent and often used as a substitute for *A. arabica* bark. *A. farnesiana* used as an adjunct to aphrodisiacs, in the treatment of spermatorrhœa (Calthrop). The bark is used as an astringent in the form of a decoction. Tender leaves bruised in a little water and swallowed; said to be useful in gonorrhœa.

The oil of *Cassia* flowers contains benzaldehyde, salicylic acid, methyl salicylate, benzyl alcohol, an aldehyde, which has an odour resembling that of decyl-aldehyde and forms a semicarbazone melting at 97° and a Ketone, which has an odour of violets and forms a semicarbazone melting at 143°. Eugenol is not present.—J. Ch. S. 1903 A. I. 845.

445. *A. arabica*, Willd., H.F.B.I., II. 293.

Syn. :—*Mimosa arabica*, Lam. *Roxb.* 421.

Sans. :—Vabhula ; Barbara.

Arab. :—Am-mughilan.

Pers. :—Kare-mughilan.

Vern. :—Babúl, kīkar (H.) ; Bábul (B.) ; Bábhul (Mar.) ; Kali-kīkar (Dec.) ; Karu-veylam (Tam.) ; Nallatamma, Barburamu, Tumma-chettu (Tel.)

Habitat :—Punjab to Behar, and Western Peninsula.

A large tree. Bark dark-brown, rough. Wood hard ; sapwood large, whitish ; heartwood pinkish white, turning reddish brown on exposure, mottled with dark streaks. Trunk thick cylindrical. Branchlets straight, finely grey downy, slender. Stipular spines variable, $\frac{1}{4}$ -2 in. long, white, sharp, straight, sometimes wanting. Leaves bipinnate, rachis downy, 2-4 in. long, pinnæ 3-6 pair, $\frac{3}{4}$ -2 in. long, with a cup-shaped gland between the lowest and sometimes between the top pair ; petioles 1-2 in. long, leaflets 10-20 pair, $\frac{1}{8}$ - $\frac{1}{4}$ by $\frac{1}{10}$ - $\frac{1}{8}$ in., glabrous, linear acute, sessile, membranous, green. Flowers bright-yellow, in globose, fasciculate heads, about 1 in. diam. ; peduncles 2-6 short, slender, grey-downy, with 2 opposite, scaly bracts, about the middle. Calyx minute, membranous. Corolla campanulate, twice the Calyx, $\frac{1}{2}$ in. long. Pod stalked, 3-6 in. long by $\frac{1}{2}$ broad, compressed, moniliform, contracted between the seeds, coriaceous, persistently white tomentose, subindehiscent, 8-12-seeded ; seeds ovoid, smooth, dark-brown. (Talbot).

Parts used :—The bark, gum, leaves, seeds, and pods.

Uses :—The tender leaves beaten into a pulp, are given in diarrhoea as an astringent (DUTT).

Some native hakeems say, it is very useful in diabetes mellitus, as the gum is not converted into sugar (DR. EMERSON).

In the Concan, a strengthening sweetmeat is made by frying the gum, with spices and butter, and making it into balls with sugar. In bloody seminal discharges, 1 tolá of the young leaves with 4 máshas of cumin and 2 tolás of sugar are eaten

or given as a draught beaten up in milk (Dymock). The bark is a powerful astringent and demulcent. It may be used as a substitute for oak galls. It has been found a valuable remedy in prolapsus ani, as an external applicant in leucorrhœa and has been recommended as a poultice for ulcers, attended with sanious discharge (Ph. Ind.)

446. *A. Leucophlœa*, Willd., H.F.B.I., II. 294, Roxb. 421.

Vern.:—Safed kicar, reru, raunj, karir, nimbar, ringa, rinj, rohani, jhind (H.); Safed-bâbul (B); Sharâb-ki-kikar, hivâr (Duk.); Goira (Uriya); Safed kicar (Pb.); Tumma, reunja, rinja (Gond.); Haribâval (Guz.); Hivar, pândharya bâbhuliche jhâda (Mar.); Vel-velam, vet-vel, vevay-lam (Tam.); (Tella-tuma) (Tel.); Bili-jâli, togral naibela, vel-vaila, bilijali topal (Kan.)

Habitat:—Plains of the Punjab, Central and S. India, and Rajputana.

A moderate-sized or large deciduous tree. Bark $\frac{3}{8}$ in. thick: colour varying with age, grey and smooth when young, dark-brown, almost black and rough when old; exfoliating irregularly in patches and strips. Wood hard; sapwood large, heartwood reddish brown, or nearly brick-red, white or grey. Leaves bipinnate, 2-3 in. long; main rachis grey-pubescent, with sessile, cup-shaped, absorption-glands between each pair of pinnae, on the grooved upper-side; pinnae 5-15 pair, $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, nearly sessile; leaflets 12-25 pair, $\frac{1}{2}$ in. long, linear, oblong, obtuse, coriaceous, grey, glabrous or pubescent. Flowers pale-yellow or white, in small globose heads, $\frac{1}{4}$ - $\frac{3}{8}$ in. diam., arranged in large, terminal, tomentose panicles; peduncles shoot with a ring of bracts about the middle. Calyx minute, $\frac{1}{4}$ in. long. Corolla twice as long as the Calyx; lobes subacute. Pods sessile, 4-8 by $\frac{1}{4}$ - $\frac{3}{16}$ in., flat, slightly curved, brown-tomentose, thickened on the sutures, subindehiscent, 10-20-seeded; seeds compressed, black areolate (Talbot).

Part used:—The bark.

Use:—The bark partakes more or less of the astringent properties of *A. arabica* (Watt).

447. *A. catechu*, Willd., H.F.B.I., II. 295.

Syn.:—*Mimosa catechu*.

Sans.:—*Khadira i.e.*, the extract.

Vern.:—The extract Katthā, khair (H.); Khayer (B.); Khoira, koir (Ass.); Khoiru (Uriya); Vodalai, vodalam, karangalli, bāga, kasku kutti (Tam.); Kanchu, Podali-manu, khadirama (Tel.); Kadaram (Mala.); khair (Mar.)

Habitat:—Through the Himalayas, from the Punjab to Sikkim.

A moderate-sized, gregarious, thorny, deciduous tree. Bark dark grey or greyish—brown, rough, exfoliating in long, narrow stripes which remain hanging. Wood very hard; sapwood yellowish white; heartwood either dark or light red. Prickles twin-hooked infra-stipular, compressed, brown, shining. Branchlets slender, thorny, glabrous, brown or purple, shining. Common petiole 3-4 in. long, often armed with scattered prickles. Pinnæ 10-20 pair; leaflets 30-50 pair, linear, imbricate, glabrous or pubescent, under $\frac{1}{4}$ in. long, turning brown on drying. Flowers pale yellow, in cylindrical spikes; petals three, the length of the Calyx. Pods thin, brown, shining, dehiscent strap-shaped, straight, dark-brown, shining, 5-6—seeded, 2-3 $\frac{1}{2}$ by $\frac{1}{2}$ — $\frac{3}{8}$ in; on a stalk $\frac{1}{5}$ — $\frac{3}{10}$ in. long. Seeds $\frac{3}{8}$ in. diam., orbicular.

Uses:—Sanskrit writers consider it to be astringent, cooling and digestive, useful in relaxed conditions of the throat, mouth and gums, also in cough and diarrhoea. Externally, they use it as an astringent and cooling application to ulcers, boils and eruptions on the skin.

In the Concan, the juice of the fresh bark is given with assafoetida in hæmoptysis, and the flowering tops with cumin, milk and sugar, in gonorrhoea (DYMCK).

Mixed with aromatics it is used by the natives in melancholia; powdered and mixed with water it is used in conjunctivitis (DR. EMERSON.)

Khersal or catechuic acid is found in cavities of the wood. It is valued in native practice as a remedy in chest affections. It is thought to promote expectoration.

Kathbol is a mixture of catechu and myrrh, given to women after confinement as a tonic, and to promote the secretion of milk (DYMCK).

Catechu is officinal in both Indian and British Pharmacopœias.

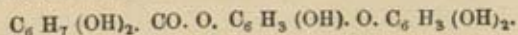
The extract known as Catechu or Catch is used medicinally as an astringent in fevers and other maladies. It is peculiarly useful in diarrhœa, with pyrosis, depending upon a relaxed state of the intestinal mucous membrane. Locally, it has also been used with much advantage in sponginess of the gums, relaxation of the uvula, hypertrophy of the tonsil, and as an astringent injection in the treatment of leucorrhœa and a tonic in menorrhagia (Ph. Ind.).

This contains Catechin which does not appear to be present in *Areca Catechu*.

The following formulæ have been assigned to catechin: $C_{15}H_{12}O_6$, air-dried (Svanberg, *Ann. Pharm.*, 1837, 24, 215). $C_{13}H_{10}O_5$, at 100° (Zwenger, *Ann. Chem. Pharm.*, 1841, 37, 320). $C_{16}H_8O_3 + 2H_2O$, air-dried (Hagen, *ibid.*, 336). $C_{16}H_{13}O_3 + H_2O$, dried in a vacuum over sulphuric acid (Dellfs, *Pharm. Centr.*, 1846, 604). $C_{17}H_{12}O_{10}$, air-dried (Neubauer, *Ann. Chem. Pharm.*, 1855, 96, 337). $C_{12}H_{12}O_5$, at 100° (Kraut and Delden, *ibid.*, 1863, 128, 285). $C_{19}H_{13}O_3$ (Hlasiwetz, *ibid.*, 1865, 134, 118). $C_{19}H_{13}O_3$ dried at 90° (Etti, *Annalen*, 1887, 186, 327). $C_{22}H_{22}O_9$ (Schützenberger and Back, *Bull. Soc. Chim.*, 1865, [ii], 4, 5). $C_{15}H_{14}O_7$, at 100° (Löwe, *Zeit. anal. Chem.*, 1874, 13, 113). $C_{21}H_{20}O_9 + 5H_2O$, air-dried (Liebermann and Tauchert, *Ber.*, 1880, 13, 964). $C_{13}H_{13}O_3$, dried over sulphuric acid (Etti, *Monatsh.*, 1880, 2, 547). In regard to percentage of carbon, the formulæ $C_{15}H_{12}O_6$, $C_{13}H_{10}O_5$, $C_{12}H_{12}O_5$, $C_{19}H_{13}O_3$, $C_{22}H_{22}O_9$, and $C_{21}H_{20}O_9$ are in fairly close agreement, but it seems likely that the remainder represent analyses of substances not completely devoid of water of crystallisation.

With the majority of workers, it appears to have been taken for granted that but one catechin exists, but this is not so according to others.

The most important decomposition products have been obtained from catechin by means of dry distillation and by fusion with alkali. By the former method, Wackenroder detected catechol, and A. Miller acetic acid, catechol, and phenol; whereas by the second Hlasiwetz, and also Etti, isolated phloroglucinol and protocatechuic acid, and Gautier the same products together with formic acid. From his results, Etti considered the following constitution for catechin as probable.



Nieubaner found that catechin was not a glucoside, and considered that this substance and catechutannic acid were related to one another, similarly as gallic acid is to ordinary gallotannin.

According to recent researches the molecular composition of catechin is represented by $C_{21}H_{20}O_9$.—*J. Ch. S.* 1902 J. 1160-1162.

The active astringent principles of catechu are a tannin formerly known as catechu-tannic acid and a crystalline body named catechin. The value of catechu as a dyeing and tanning agent depends upon the amount of these two substances, while at the same time they are a measure of its suitability as a medicine.

According to Professor H. R. Proctor of Leeds, the following are the analyses of extracts from *Acacia Catechu* :—

	Tanning matter.	Non-tanning matter.	Insoluble.	Water.
Dark Cutch	58.9	1.0	19.1	12.0
White catechu of kath ...	72.2	5.8	6.8	14.2
Yellow catechu, Pegu, Burma	69.2	8.0	10.4	12.4

Professor Proctor also forwarded some figures of recent analyses of extracts which were supposed to be derived from *Acacia Catechu*.

Mark.	Tanning matter.	Non-tanning matter.	Insoluble.	Water.	Tanning on dried extract.
Drysdale	42.2	25.6	7.6	24.6	55.8
Salatiga	30.8	29.7	2.2	37.3	49.1
B. B. Flag I	62.6	12.0	10.0	15.4	73.9
B. B. Leurel II	59.6	15.5	7.6	17.3	72.0
B. Star 3	46.5	23.2	14.9	15.4	54.9
41	41.5	17.6	4.6	36.3	65.1
42	29.6	18.8	31.1	20.5	37.3
Pegu	30.0	35.4	0.7	24.9	39.9
Assam	46.4	34.3	2.7	16.6	55.6
Ame	45.7	19.8	15.8	18.7	56.2

(Agricultural Ledger, 1906—No. 3 pp. 39-41.)

448. *A. ferruginea*, D.C. H.F.B.I., II. 295.

Syn.:—*Mimosa ferruginea*, Roxb. 423.

Habitat:—Western Peninsula.

Vern.:—Khour (Nepal); Velvelam, shimai-velvel (Tam.); Anasandra, vuni or woanee (Tel.); Kaiger (Panch Mahals); Sou khair (Berar); Kar, khair (Gond.); Pandhrâ; khair (Mar.); Teori khair (Bhil.); Bauni (Kan.).

Of the pods—Babûl-ki-sengriyân (H.); Kali-kikar-ki-phaliyan (Dec.); Velam-kâygal, Karu-vêlam-kâygal, karu-vel-kâygal (Tam.); Nalla-tumma-kâyalu, barbûramu-kâyalu, tumma-chettukâyalu (Tel.); Karu-vêlakam-kâya (Mal.); Kare-jâli-kâyi, kare-gobbali-kâyi (Can.); Bâbul-sim, bâbla-sim (Beng.); Kala-bâbili-cha-phalli, Bâbli Shing (Mah.); Kâlobâval-nu-singo (Guz).

Of the gum—The Indian Gum arabic (Eng.); Samaghe-aarâbí (Arab.) and (Pers.); Babul-kâ-gónd, Kíkar-kâ-gónd (Hind.); Kálí-kíkar-kí-gónd (Duk.); Vélam-pishin, Karu-vélam-pishin (Tam.); Nalla-tumma-banka, Tummubanka, Barbúramu-banka (Tel.); Véla-kam-pasha, Karuvela-kam-pasha (Mal.); Gobballi-góndu, Karégobbali-góndu, Karé-jali-góndu (Can.); Bábúlêr-gun, Bábla-gun, Bábúl-gun (Beng.); Vabbula-niryásam, vavula-niryásam, kála-barbúra-niryásam, barbúra-niryásam (Sans.); Kála-bábili-cha-gónda, Bábli-cha-gónda (Mah.); Kalo-bával-nu-gúndar (Guz.).

Of the bark—Babool-bark, bark of the Babool tree (Eng.); Qishrul-mughílân (Arab.); Póstedrakhte-mughílân (Pers.); Bábúl-kí-chhál, kíkar-kí-chhál (Hind.); Kálí-kíkar-kí-chhál (Duk.); Vélam pattai, Karu-vélam-patai (Tam.); Nalla-tumma-patta, Tumma-patta, Barburamu-patta (Tel.); Karu-vélakam-tóla, Vélakam-tóla, Karu-vélakam-tóla (Mal.); Góballi-patte, Karé-gobbali-patte, Karé-jali-patte (Can.); Bábúlér-sál, bábla-sál (Beng.); Vabbula-vaikalam, Vavula-vaikalam, Barbura-vaikalam, Kala-barbúra-vaikalam (Sans.); Kála-bábili-cha-patta, Bábili-Sál (Mah.); Kálo-babúl-nu-chál (Guz.).

Of the extract—Akákia (Eng.); Aqáqíyá (Arab.), (Pers.) and (Hind.)

A large, deciduous tree. Bark in. thick, rough; wood very hard, harder than that of *A. catechu*. Sapwood large, yellowish-white; heart-wood olive-brown, nearly glabrous, prickles twin, infra-stipular, slightly curved. Common petiole 3-6in. long; pinnæ 4-6 pair; leaflets 15-30 pair, grey, linear, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Flowers pale-yellow, in numerous, lax, axillary, dense spikes, which are often paniced, 3-4in. long, at the ends of branches. Pod glabrous, 3-7 by $\frac{3}{4}$ in., finally dehiscent, 4-6-seeded.

Use:—The bark possesses astringent properties (Watt.)

Physiological Actions:—The gum is demulcent, emollient and nutrient, the fresh and young pods dried in the sun, and the extract of the fresh pods or Aqáqíyá are astringent and demulcent; and the bark astringent.

Therapeutic Uses:—Aqáqíyá or a watery extract of the fresh and young legumes of this plant possesses a beneficial influence

over the membrane of the alimentary canal and genito-urinary organs, and is consequently very useful in diarrhœa, dysentery, gonorrhœa, gleet and chronic cystitis. Although the extract is less effectual in checking dysentery and diarrhœa than opium and some of its preparations, yet it is more efficacious in this respect than all other vegetable and mineral astringents when used *alone*. When dysentery or diarrhœa is complicated with dropsy, opium and its preparations are often injurious, because they generally increase the latter affection, in the same proportion as they check the two former diseases. It is under these circumstances I have found *Akâkiyá* more useful and successful in bowel-complaints than opium and all opiates. A simple powder of the fresh legumes dried in the sun before their seeds are well developed and hard, is pretty useful in diarrhœa and dysentery, and its efficacy is much greater if it is combined with some other vegetable astringents, demulcents, stimulants, and with opium, as is the case with the compound powder of *Akâkia* or *Aqâqiyá*. A decoction of the bark of this plant, together with that of the *Tamarindus Indica* and a few other trees, is frequently resorted to by the natives of this country, as a gargle in sore-mouth, and its use has often been attended with success to my own knowledge.

The gum of this plant or the Indian Gum-arabic, in the form of mucilage, is a most common and useful adjunct to other medicines in pulmonary and catarrhal affections, dysentery and diarrhœa, and in irritable states of the genito-urinary organs. It is most frequently resorted to for the purpose of suspending heavy, insoluble or immiscible medicines, such as the preparations of bismuth, &c. If the mucilage is very thick, it forms one of the best mechanical antidotes in cases of poisoning by irritant substances. It envelopes the particles or pieces of the poison on one hand, and sheaths the membrane of the stomach on the other, and thus protects the latter from the action of the former, at least, to some extent. In slight cases of cough or irritation of the throat the natives of this country, especially the Mabomedans, often relieve themselves by allowing a piece of this gum to dissolve slowly in their

mouth. I did this occasionally myself with success. It is, according to my own experiments, more adhesive than all the gums produced in India, and is therefore well suited for the formation of all kinds of lozenges. It is an ingredient in numerous prescriptions described in Persian, Arabic and Hindustani medical works.

Although a powerful astringent, Catechu is not half as useful in diarrhœa and dysentery when administered *alone*, as it is when used in combination with some other astringent and aromatic drugs, as is the case with all its preparations described in the *Pharmacopœia of India*. The compound-powder of Catechu is, therefore, very useful in the above-named diseases; in fact, it is one of the preparations most frequently used by me in the Triplicane Dispensary, particularly in the treatment of children. The Tincture of this drug is a very valuable adjunct to Mistura Cretæ, as mentioned in the *Pharmacopœia of India* and other medical works; but to ensure its best effects, it should always be mixed in each dose of the mixture just before it is administered to the patient. From some cause or other its action is not so satisfactory when it is mixed with Mistura Cretæ and kept for use for a day or two.

According to my own experience, Catechu is, in the form of injection, one of the most useful drugs in the treatment of gonorrhœa. As simple as the following formula is, it has proved successful in many cases, and sometimes even without the assistance of internal remedies:—

R. Pulveris Catechu ʒiss.

Mucil. Acaciæ ʒvi.

Aquæ puræ ad. ʒiss. *Misce fiat injectio.*

A third part to be injected three times in the 24 hours. To ensure the desired effect, some care is necessary in injecting the medicine. Having filled a glass syringe with the injection, the patient should introduce its bulbous extremity into the urethra to the extent of an inch with his right hand. Then holding upright the penis with his left forefinger and thumb, so as to compress the urethra against the syringe to prevent the escape of the fluid, he should pass the liquid freely into that canal by

pressing down the piston with his right hand. The syringe should now be withdrawn, but the orifice of the urethra should still be compressed, and the fluid be retained for two or three minutes. On removing the finger and thumb, the injection will be thrown out by the elasticity of the urethra. (MOODEEN SHERIFF).

449. *A. senegal*, Willd. H.F.B.I. II. 295.

Vern.:—Khor (Sind.); Kûmta (Rajputana.)

Habitat:—Sind and Ajmere.

A small, thorny tree. Bark smooth thin, pale, greenish-grey, yellowish under the broad dark flakes which peel off. Wood hard; sapwood yellowish-white heartwood nearly black, irregular. Infra-stipular spines 3, stout, conical, very sharp, dark-brown, shining, the two lateral straight, the third recurved. Branches flexuose, glaucous-grey. Leaf rachises not above an inch long, with a gland at the base, one between the upper pair of pinnæ. Pinnæ 3-5 pair. Leaflets 8-10 pair, grey, ciliate, rigidly subcoriaceous, $\frac{1}{2}$ in. long. Spikes pendulous, 2-3 in. long, not very dense. Flowers fragrant, white. Anthers lemon-yellow. Calyx $\frac{1}{2}$ in., campanulate, glabrous, deeply toothed. Pod 3 by $\frac{3}{4}$ in., thin, grey, indehiscent, 5-6-seeded, narrowed suddenly into a short stalk.

Part used:—The gum.

Use:—The gum is used as a demulcent and emollient. It is used *externally* to cover inflamed surfaces, such as burns, sore nipples, &c., and it blunts the acidity of irritating matters by being blended with them. The powdered gum has also been found useful in checking hæmorrhage from leech bites, and when blown up the nostrils it checks severe epistaxis.

Internally, it has been found useful in inflammations of the gastric and intestinal mucous membrane. If held in the mouth in the form of a special preparation, the gum is found serviceable in allaying cough, thus affording relief. Its influence as a demulcent is supposed to extend even to the urinary organs. The gum has also been recommended as a substitute for amylaceous food in diabetes, since it is not converted into sugar, it does but not appear to have been attended with any appreciable benefit (WATT).

450. *A. modesta*, ⁵Wall. H.F.B.I., II. 296.

Syn. :—*Mimosa dumosa*, Roxb. *M. obovata*, Roxb. 422.

Vern. :—*Palesa* (Afg.); *Phulahi* (Pb.); *Kāntosariyo* Guz.).

Habitat :—At the foot of the Western and Central Himalayas.

A thorny, moderate-sized, deciduous tree. Bark rough, with a multitude of narrow irregular cracks. Wood extremely hard, harder than that of *A. Catechu*; sapwood large, white, perishable; heartwood dark brown with black streaks (Gamble). Branches grey, glabrous, prickles twin, infra-stipular, dark-brown, shining, conical; leaf-rachis very slender, finely downy, with a small gland at the base and one between the uppermost pinnae. Leaves pale grey; common petiole 1-2 in. long, pinnae 3 pair; leaflets 3-5 pair, broad, ovate or obovate, oblique, thin, rigidly subcoriaceous, $\frac{1}{8}$ - $\frac{3}{8}$ in. long, shortly stalked, glabrous, pale green, obtuse or minutely cuspidate. Stipules minute, deciduous. Spikes 2-3 in. long, not very dense, lax, drooping. Flowers white or pale-yellow, sweet-scented. Corolla $\frac{1}{2}$ in., greenish. Pod 2-3 by $\frac{3}{8}$ - $\frac{5}{8}$ in., flat, indehiscent, 6-8-seeded, glossy, drab, glabrous, venulose, narrowed generally into a short stalk.

Use :—The tree yields a gum, which is regarded by the people of the Peshawar Valley as restorative (BELLEW).

451. *A. concinna*, Dc. H.F.B.I., II. 296.

Syn. :—*Mimosa concinna*, Willd. Roxb. Fl. Ind. II. 565.

Sans. :—*Saptala*.

Vern. :—*Ban rithā*, Kochai (B.); *Aila*, Rassaul (Oudh); *Shika* (Tam.); *Shikaya*, gogu (Tel.); *Chinik* (Mal.); *Shikekai*, *chikekai* (Dec.); *Sige* (Kan.)

Habitat :—The Eastern Himalayas; Eastern and Western Peninsulas.

A large climbing shrub, suberect up to about middle-age; stem terete, greyish, brown-with 5 vertical lines of strong conical prickles; branches grey-canescens. Leaf-rachis 4-8 in. long, downy, with a large gland about $\frac{1}{2}$ in. above the base and a smaller one between the uppermost pinnae. Pinnae 3-6 pair, 2-3 $\frac{1}{2}$ in. long; stipules $\frac{1}{4}$ - $\frac{3}{8}$ in. long, lanceolate. Leaflets acid, 6-20, but generally 10-14 pair on each pinna, with a small

odd one near the base. $\frac{1}{2}$ - $\frac{2}{3}$ by $\frac{1}{10}$ - $\frac{1}{4}$ in. linear, oblique at the base, quite rounded at the tips, membranous, pale green above, glaucous beneath; midrib somewhat diagonal. Panicles 3-4 ft. long, interrupted with leaves at the base of the ramifications; peduncles 1-1 $\frac{1}{2}$ in. long, slender, downy, in fascicles of 2-4, lower in the axils of the leaves, upper bracteate; bracts $\frac{1}{10}$ - $\frac{1}{4}$ in. long, obliquely ovate-cordate, deciduous. Heads $\frac{2}{3}$ - $\frac{1}{2}$ in. diam. 55-60-flowered, brick-red in bud. Flowers $\frac{1}{2}$ in. long. Calyx deep crimson, about $\frac{1}{10}$ in. long, tubular, deeply 5-toothed; teeth subacute. Petals acute, white with a reddish median line, slightly exserted; stamens numerous, much exserted, at first white, withering yellow; filaments very slender. Pod 3-4 by $\frac{1}{10}$ in., straight, thick, fleshy; 6-10-seeded, slightly indented between the seeds. Sutures broad.

Use:—The pod is acid, bitter, and has a singular pungency; its qualities are allowed to be deobstruent and detergent and expectorant; it is commonly ordered in cases of jaundice and other biliary derangements, and is, besides, used by the Indians like soap-nut for washing the head. The small leaves are frequently put into pepper-water to keep the bowels open or work off bile (AINSLIE).

The soft parts of the dried berries contain 5 p. c., and those *A. concinna*, var. *rugata* 4 p. c. of the Saponin $C_{20}H_{32}O_{10}$.—J. Ch. S. 1901 A. I. 648.

452. *A. intsia*, Willd., H.F.B.I., II. 297.

Syn.:—*Mimosa intsia*, Linn Roxb. 424.

Habitat:—The Tropical Himalayas, Eastern and Western Peninsulas.

Vern.:—Arhai-ka-bêl (Sutlej); Kartar (Kumaon); Kondoojanum (Santal); Kundaru (Kol.); Harrari (Nepal); Payirrik, ugroemrik (Lepcha); Korinta, Korendam (Tel.); Chilari (Mar.)

A large prickly climber, at first with 5 vertical lines of hooked prickles, afterwards deeply 5-fluted along those lines, suberect and bushy in early youth. Bark pale grey. Wood white soft, porous. Leaf-rachis 5-7 in. long, angled; with a gland near the base, and 0 or 2-3 below the upper pinnae; pinnae 6-8 pair, 2-3 in. long. Leaflets 8-12 pair $\frac{2}{10}$ - $\frac{1}{2}$ in. by $\frac{1}{8}$ - $\frac{1}{2}$ in., ligulate,

dark green, nearly glabrous and shining above, pale beneath. Panicles large. Heads pale yellow, peduncled, $\frac{2}{3}$ - $\frac{1}{2}$ in. diam. brown in buds, generally 1-4 together. Pod 4-6 by $\frac{7}{16}$ - $1\frac{1}{2}$ in., strap-shaped, dark-brown, dehiscent finely pubescent, hardly-stalked. Seeds 8-12.

Use :—'The flowers are used by Santal women in deranged courses.' (Rev. A Campbell, Santal Mission, Pachumba).

453. *A. pennata*, Willd. H.F.B.I., II. 297.

Syn :—*Mimosa pennata*, Lin. *Roxb.* 424.

Vern :—Agla, awal (Kumaon); Kumdaree (Kol); Arar (Kharwar) Biswool (H.); shembi (Bomb.); Undaru (Santal); Arfu (Nepal); Tolrik (Lepcha.)

Habitat :—The Central and Eastern Himalayas, Behar, Eastern and Western Peninsulas.

A large climbing shrub. Bark reddish brown, $\frac{1}{4}$ in. thick, with horizontal cracks. Wood porous, moderately hard; reddish brown prickles on branchlets petioles and inflorescence; branchlets and petioles pubescent. Pinnæ 20-40 pair, leaflets $\frac{1}{8}$ - $\frac{1}{2}$ in. long, 30-60 pair, narrow-linear, overlapping, making each pinna like the feather of a bird. Flower-heads white or pale yellow, 4-8 together in the axils of leaves or bracts, forming large racemiform panicles, bracts linear minute. Pod shining, very thin, straight, strap-shaped, glabrous, dehiscent, 6-8 by $\frac{3}{4}$ - $1\frac{1}{2}$ in., distinctly stalked, 8-12-seeded, the sutures rather raised, slightly repand.

Uses :—In the Concan, the leaf-juice mixed with milk is given to infants who suffer from indigestion of milk with black stools. In bleeding from the gums the leaves are chewed with cumin and sugar, they are also rubbed to a pulp and mixed with cow's milk, cumin and sugar, as a remedy for scalding of the urine. (DYMCK.)

454. *Albizzia Lebbeck*, Benth. H.F.B. I., II. 298.

Syn :—*Mimosa Sirissa*, *Roxb.* 417.

Sans :—Shirish.

Vern :—Siris, sirin, mathirsi, lasrin, kalsis tantia (H.);

Sirisha (B); Sirasa, shirrus, suri, (Sind); Vaghe, kat vaghe (Tam.); Dira san (Tel.); Chapot siris (Santal); Tinia (Uriya); Kalbaghi, bengha, dirisana, goddahunse (Kan); Chichola, mothâsiras (Mar.); Doli, saras (Panch mahals); Pilo sarshio (Guz.).

Habitat :—From tropical Himalayas throughout India.

A large, deciduous, unarmed tree. Bark brownish grey, rough, with numerous short irregular cracks. Wood hard; sap-wood large, white or yellowish; heart-wood dark-brown, streaked with lighter or darker streaks. Leaves with glabrous or downy rachises and a gland near the base of the main petiole; pinnæ 4-8, with or without a gland between the lowest. Leaflets short-stalked, rigidly sub-coriaceous, obliquely-oblong, $1\frac{1}{2}$ in. long, glabrous or finely grey, downy; mid-rib prominent; reticulate veins, nearly as prominent as secondary nerves. Flower-heads many, large, white, fragrant, on penduncles, 2-4 in. long, in fascicles of 2-4 from the upper axils, forming short corymbose racemes. Flowers $1\frac{1}{2}$ in. long to the extremity of stamens; pedicels very nearly as long as Calyx. Calyx half the length of Corolla. Corolla greenish yellow, $\frac{1}{2}$ in.; teeth short, lanceolate. Style filiform. Pods thin, straw-coloured strap-shaped, firm, yellow-brown, dehiscent, 8-12 by 1-2 in., 6-10-seeded.

Parts used :—The seeds, bark, flowers and leaves.

Uses :—The seeds form part of an *anjan* used for ophthalmic diseases (Stewart). The oil extracted from them is considered useful in leprosy. The bark is applied to injuries to the eye, (Madden.)

The bark and seeds are astringent, given in piles, diarrhœa, etc. The flowers are used as a cooling medicine, and also externally applied in boils, eruptions and swellings. The leaves useful in ophthalmia (Baden-Powell's Punj. Products, p. 345).

"Powdered seeds have been successfully administered in cases of scrofulous enlargement of the glands. A paste of powdered seeds and water is useful as a local application at the same time (Asst-Surg. Gholam Nabi). "The powder of the root-bark is used to strengthen the gums when they are spongy and ulcerative (Native-Surgeon, R. Moodeliar, Madras).

455. *A. odoratissima*. Benth. H.F.B.I., II. 299.

Syn.:—*Mimosa odoratissima*, Linn. *Roxb.* 418.

Vern.:—Siris, bhandir, bersa, bansa (H.); Lasrin, karambru, polach (Pb.); Jatikoroi (Ass.); Siras (Bomb.); Kal-thuringi, Karvaghe, bilwara (Tam.); Shinduga (Tel.); Siris, chichna chichâda, siras (Mar.); Kalo-sarasio (Guz.); Pullibaghi, billawar, bilvara (Kan.)

Habitat:—From the foot of the Central Himalayas throughout India.

A large, deciduous tree, with dark green-foliage, and without prickles. Bark $\frac{1}{4}$ in. thick, grey, with irregular cracks and darker patches, granular. Wood hard; sapwood large; white heart-wood dark-brown, with darker streaks. Branchlets petioles and inflorescence pubescent; leaf rachis finely downy, with a gland at the base of the petiole and of the 1-2 upper pinnae; pinnae 3-8 pair; leaflets 10-25 pair, $\frac{3}{4}$ -lin. long, oblong-obtuse, unequal-sided, somewhat falcate, pale glabrous or pubescent beneath. Flower-heads pale yellow, fragrant, in compact corymbs arranged in large terminal panicles. Corolla and Calyx densely strigose, with short hairs, the former campanulate, 5 times longer than the Calyx. Anthers yellow. Pods 6-8 in. long, lin. broad, dehiscent, tomentose when young, glabrous when ripe.

Parts used:—The bark and leaves.

Use:—The bark applied externally, is considered efficacious in the leprosy and in inveterate ulcers. The leaves boiled in *ghi* are used by Santals as a remedy for coughs. (Revd. A Campbell, in Watt's Dictionary).

456. *A. Julibrissin*, Durazz. H.F.B.I., II. 300.

Syn.:—*Mimosa Kalkora*, *Roxb.* 418.

Vern.:—Kolkora (B.): Sirin, kurmru, surangru, shrish, buña tandai, mathirsi, brind (Pb.); Lal siris, baraulia, baran, bhokra (H.)

Habitat:—Throughout the Himalayas, from Hazara to Sikkim.

A large shrub or middle-sized, unarmed, deciduous tree. Young shoots, inflorescence and common petiole tomentose or pubescent. Leaf-rachis, with a small gland, at the base of the petiole, and between the upper pinnæ; pinnæ 6-12, says Brandis; 8-24, says J. G. Baker. Leaflets 10-30 pair, membranous, sessile, sensitive, $\frac{1}{4}$ in. long, cuspidate, straight on the upper side, rounded on the lower, $\frac{1}{8}$ in. broad. Heads globose on clustered erecto-patent peduncles, from the crowded leaflets upper nodes. Flowers 1-1 $\frac{1}{2}$ in. to extremity of stamens. Calyx $\frac{1}{8}$ - $\frac{1}{6}$ in., funnel-shaped, shortly-toothed; filaments rose-red, Calyx and Corolla both hairy outside. Pod softly pubescent white, young, glabrous when mature, membranous, grey or pale brown, 5-6, $\frac{3}{4}$ by lin., 8-12-seeded, narrowed to a beak and short stalk, indehiscent.

Use:—Used like *A. lebbeck*.

457. *A. amara*, Boiv. H.F.B.I., II 301.

Syn.:—*Mimosa amara*, Roxb. 418.

Sans.:—Krishna sirish.

Vern.:—Lulai or lâlî Mar.; Moto sarsio (Guz.); Thuringi, wûnja, suranji, shekram (Tam.); Nallarenga, shekrani, sikkai, narlingi (Tel.); Wusel (Madura, Madras) Bil-kambi (Kan.); Kadsige (Coorg); Dosulay (Mal.).

Habitat:—Western Peninsula.

A middle-sized, deciduous tree. Wood very hard; sapwood large white; heart-wood purplish-brown, beautifully mottled with alternate, concentric, light and dark bands. Branchlets, petioles and inflorescence soft yellow-tomentose. Leaf-rachis, with a small gland on the petiole and between the lowest pair of pinnæ. Pinnæ 6-15; leaflets linear, 15-24 pair; peduncles copious, axillary, densely tomentose, crowded at the upper nodes in the axils of much-reduced leaves. Flowers yellow, fragrant, $\frac{1}{2}$ in. long to the end of stamens. Calyx $\frac{1}{4}$ in., funnel-shaped, shortly stalked. Corolla 3 times as long as the Calyx. Calyx-teeth lanceolate. Pod 5-9 in. by $\frac{3}{4}$ lin., 6-10-seeded, opaque grey-brown.

Parts used :—The seeds, leaves and flowers.

Uses :—Described by Hindoo writers as cooling and useful in inflammatory affections; the oil of the seeds is given in white leprosy, and the powdered seeds, as an astringent; the flowers and leaves are applied in local inflammations, such as boils, erysipelas, &c. (DUTT).

The seeds are astringent, given in piles, diarrhœa, gonorrhœa, &c.; the oil extracted from them is said to cure white leprosy. The flowers are considered by the natives as a cooling medicine, and are externally applied to boils, eruptions, and swellings. The leaves are regarded as useful in ophthalmia, and afford good fodder for cattle. (Baden-Powell's *Punjab Prod. s. v. Acacia speciosa*, page 345.)

458. *Pithecolobium Bigeminum*, Benth. H.F.B.I., II: 303.

Syn. :—*Mimosa lucida*, Roxb. Fl. Ind. II. 544. *Inga bigemina* Willd.

Vern. :—Kachlora (H.).

Habitat :—Forests of the outer Himalaya, from the Ganges eastward and of South India.

A large tree; wood light brown, soft, subterete. Branchlets, common petioles and inflorescence rusty-puberulous. Pinnæ and leaves long-petioled. Pinnæ 2-3 pair; leaflets of the lowest pinnæ 1-3, of the terminal 3, sometimes 4 pair, elliptic, acuminate, glabrous, dark-green. Flowers cream-coloured, $\frac{1}{2}$ in. long to extremity of stamens, sessile or shortly pedicelled in 2-5-fid heads. Heads in slender, terminal or supra-axillary panicles. Pod flat, not indented between seeds, 3-5 by $\frac{3}{4}$ in., bright red within, curved into a ring or spiral.

Use :—A decoction of the leaves is a medicine for leprosy and is used as a stimulant to promote the growth of hair, (ATKINSON).

N. O. ROSACÆ.

459. *Prunus Amygdalus*, Baill, H.F.B.I., II. 313.

Syn.:—*Amygdalus communis*, Linn. Roxb. 403.

Var.:—*Amara*.

Vern.:—*Karda-badâm* (H.); *kadveṇ-badâm* (M.)

Var.:—*Dulcis*.

Vern.:—*Mitha badâm* (H.); *Gode badâm* (M.)

Habitat:—Cultivated in the cooler parts of India.

A middle-sized tree-wood light brown, moderately hard. Leaves greyish when full grown, oblong-lanceolate, serrulate, petiole equal to or longer than the greatest width of leaf, stipules fimbriate. Flowers white, tinged with red appearing before the leaves from scaly buds on last year's wood, peduncles much shorter than the campanulate Calyx. Drupes velvety, pericarp dry, when ripe, separating into 2 valves, stone compressed with shallow wrinkles and minute holes.

Use:—The author of the *Makhzan* notices the use of the burnt shells as tooth-powder, and of the unripe fruit as an astringent application to the gums and mouth. Bitter almonds are described by Mahomedan writers as attenuant and detergent; they are recommended both internally and externally for a variety of purposes. As a plaster made with vinegar, they are used to relieve neuralgic pains; as a collyrium, to strengthen the sight; in emulsion with starch and peppermint to allay cough. They are also considered to be lithontriptic and diuretic, and of use for removing obstructions of the liver and spleen; applied to the head, they kill lice; as a suppository, they relieve pain in difficult menstruation; as a poultice, they are a valuable application to irritable sores and skin eruptions. The root of the tree is described as discutient and alternative; it is used both internally and externally (Dymock).

The juice of almonds mixed with sugar is used in coughs. Almonds mixed with figs are used as a laxative and to relieve pain in the bowels. (DR. EMERSON.)

Official in both Indian and British Pharmacopœias.

"Bitter almonds produce analogous effects to those of hydrocyanic acid, and may therefore be medicinally used in similar cases; but their administration is not desirable, as the amount of hydrocyanic acid generated is liable to great variation, and their effects, therefore, cannot be relied on with the same degree of certainty as those of hydrocyanic acid. In large quantities bitter almonds have caused serious and even fatal consequences, their poisonous effects being similar to those of hydrocyanic acid." (*Bentley and Trimen*).

"Sweet almonds may be used for the extraction of almond oil, yet they are but rarely so employed (at least in England), on account of the inferior value of the residual cake. The only other use of the sweet almond in medicine, is for making the emulsion called *Mistura Amygdalæ*." (*Pharmacographia*).

Sweet almonds yield from 44 to 55 per cent. of oil, whereas bitter almonds, on an average, give from 38 to 45 per cent. Bitter almonds are more frequently used for expressing the oil, though the oil from both varieties is practically identical. Almond oil does not easily turn rancid, and is largely used for pharmaceutical purposes. The constants of this oil are: Specific gravity at 15°, 0.914–0.920; saponification value, 189.5–195.4; iodine value, 94–101; Maumene test, 51.5–54; oleo-refractometer reading at 22°, +8 to +10.5; fatty acids, melting point 13°–14°; iodine value, 93.5 to 96.5.

The German Pharmacopœia test for pure almond oil is that the mixed fatty acids should remain liquid at 15° for an indefinite length of time.

460. *P. persica*, *Bentl and Hook*; H.F.B.I., II. 313.

Syn.:—*Amygdalus Persica*, *Linn. Roxb.* 403.

Vern.:—*Arû* (H.) *Tapks* (*Lepcha*); *Arû sunnû*, *fsûnu*, *arûi*, *chamnânu*, *aor*, *bem beimi*, *bemhi*, *katharti*, *mundla*, *aru* (Pb.)

Habitat:—Cultivated in the cooler parts of India.

A middle-sized tree. Bark grey, shining, smooth, with numerous horizontal corky lenticels divided in the middle. Wood red, scented, hard, close-grained; structure the same as in *P. amygdalus* (Baillon). Foliage dark-green. Leaves lanceolate, sharply serrate; petiole shorter than the greatest width of leaf; stipules subulate, fimbriate. Flowers sessile, pink, generally appearing before the leaves, mostly solitary, from

scaly buds on the previous year's wood. Calyx campanulate, segments woolly. Drupe downy or glabrous. Pericarp tender, succulent, stone deeply and irregularly furrowed (Brandis).

Use:—The fruit is given as a demulcent, an antiscorbutic, and a stomachic.

The natives of the Punjab believe the fruit to be useful in worms, *Ascaris lumbricoides* (Balfour.)

The flowers are purgative.

Like other species of *Prunus*, the kernels yield an oil, used by the natives of North-West Himalaya for cookery, illuminating purposes, and as a dressing for the hair. The kernels contain 32–35 per cent. of a pale yellow oil similar to almond oil. In Europe the oil enters into the composition of "French almond oil."

461. *P. Armeniaca* Linn. H.F.B.I., II. 313, Roxb. 403.

Vern.:—Chuari, zardâlu, khobani (H.); Hari, gardali, shiran (Pb.); Iser (Kashmir); Chûârû, chola (Kumaon); Zardâlu (Push.) (to.)

Eng.:—The apricot.

Habitat:—Cultivated and almost naturalised in N. W. India.

A middle-sized, deciduous tree. Bark dark-brown, rough with narrow longitudinal clefts. Sapwood white; heart wood greyish-brown, mottled with dark-brown streaks, moderately hard. Leaves convolute in bud, appearing after or with the flowers, broadly ovate, nearly as broad as long, acuminate, crenate; petiole glandular, half the length of the leaf; stipules lanceolate. Flowers pinkish white, solitary or fasciculate, from scaly buds on the previous year's wood. Peduncles short. Drupe downy or glabrous; pericarp tender, succulent, indehiscent. Stone smooth, with a thickened sulcate margin.

Use:—It is stated that apricots form antidotes to hill sickness. In Tibet, they are applied after mastication in ophthalmia; and Bellew mentions that the dried fruit is in Afghanistan, used as a laxative and refrigerant in fevers, &c. (Stewart).

Differences between Almond and Apricot kernel oil.

	Almond oil.	Apricot Kernel oil.
Iodine value	99.2	103.4
Saponification value	201.6	199.8
Zeiss butyro-refractometer reading at 25°C.	58.0	59.0
Refractive index at 25°C.	1.4644	1.4645

Apricot kernels contain from 40 to 45 per cent. of an almost colourless oil which becomes yellow on keeping. Apricot oil is so similar to almond oil in its physical and chemical characters that most of the figures for these constants are of very little use for the purpose of identification. Apricot oil, however, with nitric acid, specific gravity 1.4, assumes an orange colour, and with Bieber's reagent a peach-blossom colour is obtained. Bieber's test is carried out by agitating five volumes of oil with one volume of a mixture consisting of equal parts (by weight) of concentrated sulphuric acid, fuming nitric acid, and water. Pure almond oil does not change in colour, whereas apricot kernel oil gives a pink (peach-blossom) colour, and peach kernel a faint pink colouration after standing some time. Mixtures containing 25 per cent. of apricot oil cannot be detected with certainty by means of this test.

462. *P. Cerasus*, Linn. H.F.B.I., II. 313. Roxb.
403.

Vern.:—Alu-bālu (U. P.); Gilās, olchi (Pb.)

Habitat:—Cultivated in the Himalayas, the Punjab and the United Provinces.

A middle-sized tree, the bark peeling off in horizontal stripes. Leaves elliptic or obovate, abruptly acuminate, irregularly crenate, serrate; petioles less than breadth of leaf, 2 glands on petiole or on the base of the blade, stipules fimbriate. Flowers white, on long slender pedicels, in fascicles of 2-5, from lateral, generally leaf-bearing, buds. Calyx turbinate, lobes obtuse. Drupes glabrous, with a polished round stone.

Uses:—The bark which is bitter, is said to possess febrifugal properties. The kernel is supposed to be a nervine tonic, and is used for the same purposes as hydrocyanic acid, of which it contains a considerable proportion. (WATT).

463. *P. puddum*, Roxb. H.F.B.I., II. 314.

Syn.:—*P. sylvatica*, Roxb. 403. *Cerasus pudum*, Wall.

Sans.:—Padmaka, padmāksh.

Vern.:—Paddam, pāya (Hind.); Kongki (Lepcha); Chami-ari amalguch (Pb.); Padma kāsṭha, padmaka (Mar.); Padma kathi, padmak (Guz.).

Habitat:—Temperate Himalaya, from Garhwal to Sikkim and Bhotan.

A middle-sized or large, deciduous tree. Bark pale-brown to dark-brown, shining, peeling off in thin horizontal shining layers. Wood moderately hard, scented; sapwood white; heartwood nearly glabrous. Leaves conduplicate in bud, glossy, ovate, long acuminate, sharply serrate; blade 3-5, petiole $\frac{1}{2}$ in. long, one or more conspicuous glands on petiole. Stipules pinnately or palmately divided, the divisions linear, glandular-fimbriate. Flowers white, pink or crimson, appearing before the leaves in umbellate fascicles, approximate near the ends of branchlets; pedicels slender, as long as or longer than the calyx. Calyx turbinate, lobes ovate, acute.

Fruit, a drupe oblong or ellipsoid, obtuse at both ends. Flesh, scanty yellow, or reddish, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, acid, somewhat astringent. Stone ovoid, bony, rugose and furrowed, supported by the calyx base, from which the tube separates after flowering.

Use:—The kernel is used in stone and gravel. The bark contains amygdalin, and the smaller branches are sold in the bazaars as substitutes for hydrocyanic acid in native practice (Watt).

The seeds of the Bird cherry growing in the Himalayas yield a peculiar oil remarkable for its siccative properties. A sample of the freshly expressed oil gave the iodine value (Hubl) 172. It dried to a skin in glass more rapidly than boiled linseed oil. The pressed cake and seeds distilled with water afforded considerable quantities of hydrocyanic acid and benzoyl aldehyde (oil of bitter almonds.)

464. *P. communis*, Huds. H.F.B.I., II. 315.

Habitat:—Western temperate Himalaya; cultivated or indigenous from Garhwal to Kashmir.

A shrub or moderate-sized tree, unarmed or spinescent, young shoots pubescent. Wood reddish brown, hard, very close-grained, warps and splits. Leaves ovate or ovate-lanceolate, serrate or more or less pubescent beneath, along the nerves; petioles shorter than greatest breadth of leaf, stipules linear, fimbriate. Pedicels slender, 3 or 4 times the length of Calyx, solitary or fasciculate from lateral, often leaf-bearing buds. Calyx-tube campanulate. Drupe globose or oblong, pericarp fleshy.

The plum.

(I) Var. *Domestica*.

Vern.:—Olchi, er, aor (Pb.)

A small, rigid, much-branched shrub. Branches without pines always smooth, straight. Bark brown. Leaves ovate lanceolate, a little pubescent and in pair. Calyx velvety inside, flowers white appearing together with or a little before the young leaves. Drupe 1-1½ in, diam; black.

Commonly wild and cultivated in Kashmir and Afghanistan. Madden states that it is also cultivated about Almora.

The dried drupes are demulcent and laxative; rarely employed alone for medicinal purposes. The pulp forms an ingredient of *Confectio Sennæ*, the *Electuarium lenitivum* of the old Pharmacopœias. The fruit, stewed and sweetened, is used as a domestic laxative (*Pharmacographia*).

(II.) Var. *Insititia*.

Syn.:—*P. bokhariensis* Linn and *P. aloocha*, Royle.

Vern.:—Aloo-bokhârâ (Hind., Bom., and Pers.); Alpogâda pazham (Tam.).

Western temperate Himalaya, cultivated or indigenous, from Garhwal to Kashmir, 5,000 to 7,000 feet in altitude.

Var.:—*Insititia*, Linn.

Syn.:—*P. insititia*, Linn.

P. bokhariensis and *P. aloocha*, Roxb.

Shrubby, unarmed or spinous. Leaves obovate ovate or ovate-lanceolate, serrulate, obtuse, acute or cuspidate, nerves hairy

beneath; peduncles solitary or in pair. Calyx-tube obconic. Drupe globose or ovoid, drooping.

The Bokhara Plum, in a dry state, is met with in the Indian bazaars. It is described as sub-acid, cold and moist, digestive and aperient, especially when taken on an empty stomach, useful in bilious states of the system and heat of body. The root is astringent, and the gum may be used as a substitute for Gum Arabic (Dymock). Largely imported into India and exhibited for sale in every bazaar, being largely used as an article of food. With a little sugar they are pleasant and refreshing.

The oil, resembling apricot kernel oil, is prepared from the seeds, and is used for illuminating and edible purposes.

465. *P. Padus*, Linn. H.F.B.I., II. 315.

Syn:—*Cerasus corunta*, W II.

English:—The Bird Cherry.

Vern:—Jamana (Hind.); Likh-arū, arupatai (Nepal); Hlo sa hlot-kūng (Lepcha); Pāras, kala-kat, gidar-dāk, zambu, chūle (Pb.); Jāman, zamb-chūle (Kashmir).

Habitat:—Temperate Himalaya, from Murree to Sikkim and Bhotan.

A deciduous tree attaining 50-60ft., with dark rough bark. Wood moderately hard; sapwood large, whitish; heart-wood reddish-brown, with an unpleasant smell, says Gamble. Wood handsome, "polishes well," says Brandis. Young shoots, inflorescence, and underside of leaves along nerves pubescent. Leaves conduplicate in bud, from a slightly cordate base, ovate, oblong, acuminate, serrate; stipules thin, linear lanceolate, early caducous. Flowers white, appearing after the leaves; Racemes 3-8in. long, at the end of short lateral (often leaf-bearing) branchlets; bracts thin, caducous longer than buds. Drupe acid, globose, $\frac{1}{2}$ in. diam. first red, then dark purple, or nearly black. Stone rugose, thick.

Use:—Yields a poisonous oil, like oil of almonds, much used in medicinal preparations (Watt).

466. *Prinsepia utilis*, Royle. H.F.B.I., II. 323.

Vern.:—Bhekal, karanga, cherra jhatela (H.); Gurinda (Hazara); Jinti (Chenab); Bekling (Kanâwar); Chirârâ, jhatela, dhatela, phalâwa bhekla, dintili, bhekra, bhekala (Kumaon).

Habitat:—Dry rocky hills on the temperate Himalayas, from Hazara to Sikkim and Bhotan, and the Khasia Mts.

A deciduous, thorny shrub, glabrous, youngest shoots very pubescent, spines green, axillary, often leaf-bearing. Bark thin brown, peeling off in small vertical flakes; under bark orange. Wood red, very hard and compact, close and even-grained, but much liable to split; pith large, separating when dry into horizontal layers. Leaves lanceolate, entire or serrate, 1-5 in., coriaceous, acuminate. Flowers $\frac{1}{4}$ in. diam.; white, in short racemes, generally at the base of spines. Calyx-tube cup-shaped, lobes 5, unequal imbricate in bud; petals rounded, claw short, stamens numerous, inserted below the petals in several rows, anther-cells separated by a broad connective. Carpel one, sessile, ovules 2, collateral. Fruit an oblique, oblong-cylindrical, fleshy purple Drupe, $\frac{1}{2}$ - $\frac{2}{3}$ in., subtended by the withered calyx. Scar of style basal, endocarp coriaceous. Seed only one.

Use:—This shrub yields an oil, used as a rubefacient and as an application in rheumatism and pains from over-fatigue (Atkinson.)

The seeds of this shrub, known as *Bhekul*, yield an oil by expression which is used in the North-West Himalaya for food, illuminating, and occasionally in medicine. It is said to be exported in small quantities from Garhwal and Kumaon. There are two samples in the Indian Museum; one from the Kangra Valley of a bright green colour, and the other from Bashahr in the Punjab, opaque and light brown in colour. In specific gravity, iodine value and melting point of the insoluble fatty acids, the oils resemble that derived from cotton seed.

467. *Rubus moluccanus*, Linn. H.F.B.I., II. 330, *Roxb.* 408.

Vern.:—Bipem-Kanta (Nepal); Sufokji (Lepcha); Katsol (Kumaon).

Habitat:—Central and Eastern tropical and temperate Himalaya; Nepal; Sikkim; Assam; Khasia Mts. Eastern Peninsula. Western Peninsula, on the Ghats from Bombay southward,

A prickly shrub. Stems stout, densely covered with woolly grey or yellowish hair and set with numerous strong, hooked prickles. Leaves simple, $3\frac{1}{2}$ -5in., usually about as broad as long, cordate at base, acute, more or less deeply 5-(7)-lobed, with obtuse or subacute lobes, unequally dentate-serrate, glabrous or hairy on veins, and bright green above, very hairy and more or less yellowish or grey beneath, with prominent reticulate venation and often with prickles on the main veins. Petiole long, $1\frac{1}{2}$ -1 $\frac{1}{2}$ in., very hairy, with prickles beneath. Stipules large, ovate, deeply pectinate, very silky, enclosing the buds, caducous. Flowers white (often two recognized varieties, the other being bright pink), in elongated terminal panicles, on long stout pedicels; bracts oval, toothed or pectinate at end only. Calyx densely silky-hairy, segments entire or pectinately toothed at end. Petals fully half as long as the Calyx-segments. Fruit bright red or dull purplish, succulent, carpels numerous.

One of the varieties, named *Macrocarpus* Gardner, "is the only real black-berry of Ceylon, and is large and juicy, and when quite ripe has a good flavour" (Trimen).

Use:—The fruit is considered by the Malaysians a valuable remedy for the nocturnal micturition of children, and the leaves a powerful emmenagogue and abortifacient (Rumphias).

468. *Gerish urbanum* Linn, H.F.B.I., II. 342.

Habitat:—Western temperate Himalaya from Murree to Kumaon, at an altitude of 6,000 to 11,000 feet.

Erect, perennial herbs. Stems 1-3ft., stout or slender, from a woody root-stock, sparsely hairy. Lower leaves pinnatisect, terminal leaflets of radical leaves 2-3in. diam. orbicular, lobed or crenate; lateral much smaller, often minute, sessile, broad, variously cut and lobed. Stipules leafy, lobed and toothed. Flowers erect, $\frac{1}{2}$ - $\frac{3}{4}$ in. diam.; peduncle slender. Petals yellow, narrowly obovate toothed, equalling or exceeding the Calyx-lobes, which are acuminate and reflexed in fruit. Style in fruit, forming an awn, $\frac{1}{4}$ in., hooked at the tip or below it. Achenes spreading and recurved; receptacle villous; head of hispid achenes sessile.

Uses:—The root is astringent, tonic, and antiseptic, but it is undeservingly neglected in modern practice (*British Flora Meidca*).

This plant does not seem to be used for medicinal purposes in India.

Source and composition of the essential oil of Herb Bennett Root. A new glucoside and Enzyme.

The dried root of Herb Bennett (*Geum urbanum*) has a feeble odour resembling that of cloves. If the plant be carefully plucked so as to leave the root intact, there is no manifestation of the characteristic odour, but this is at once detectable when the root is crushed between the fingers. The explanation of this phenomenon was established by the following experiments.

By extraction of the fresh root with boiling alcohol of 95°, distillation of the extract under reduced pressure, extraction of all the residue with alcohol, and precipitation of the solution by excess of ether, a substance is obtained which is odourless, but however contains the substance which gives rise to odoriferous principle. This proves to be eugenol.

Another portion of the root was macerated with sand and extracted with cold alcohol of 90°. The residual powder, which contains an enzyme, was dried at 30°. On adding to an aqueous solution of the first substance, a little of the ferment powder, a distinct odour of cloves is at once evident. If the ferment powder is previously heated in boiling water, the effect is not observable. It is concluded from these observations that the odoriferous principle does not exist free in the Herb Bennett root, but is produced from some other substance present by the action of an enzyme. The substance is a glucoside; on addition of the enzyme to its aqueous solution, the reducing power and the rotary power both gradually increase.

The active enzyme is characteristic, the resolution of the glucoside is not effected by emulsin, invertase, or by the enzyme of *Aspergillus niger*. It cannot be extracted by treatment of the roots with water.

The glucoside can be isolated in globular crystals by addition of ether to the alcoholic solution. The term *gein* is proposed for the glucoside, and *gease* for the enzyme.—J. Ch. S. 1905 A II 345.

469. *G. elatum*, Wall. H.F.B.I., II. 343.

Vern.:—Gunglu junglic (Pers.); gogjemool (Cashmere).

Habitat:—Subalpine to Alpine Himalaya; from Kashmir to Sikkim.

Rootstock stout, woody. Leaves pinnatisect, hairy, 4-12in., linear-oblong; leaflets $\frac{1}{2}$ -lin., close and imbricating or scattered, uniform or the alternate smaller, terminal orbicular, all lobed and coarsely crenate, upper all adnate by a broad base.

Flowering stems with few leaves, and 1-6 flowers. Flowers $\frac{1}{2}$ -1 $\frac{1}{2}$ in. diam. Calyx-lobes deltoid-ovate, acute, silky, spreading in fruit. Petals orbicular, yellow, much exceeding the Calyx. Carpels sessile on the base of the Calyx, clothed with long, silky hairs. Achenes ellipsoid, acute at both ends, hairy. Style $\frac{1}{2}$ in., slender, straight in fruit.

Use :—The root of this plant, officinal in Kashmere, is one of the most valuable of remedies (Honnigberger). Its uses are similar to those of *G. urbanum*.

470. *Potentilla nepalensis*, Hook, H.F.B.I., II. 355.

Vern. :—Rattanjot (Pb.)

Habitat :—Western temperate Himalaya, from Murree to Kumaon.

Herbs, with perennial woody root-stock. Leaves long petioled, digitately 5-foliolate, or upper 3-foliolate. Stems erect, leafy-branched, 3-flowered, stout or slender, from densely villous to glabrate. Radical leaves 12 by 3 in.; leaflets sessile; 1-3 by $\frac{1}{4}$ -1 $\frac{1}{4}$ in., membranous, rarely acute, teeth obtuse or acute, base entire, cuneate; obovate or elliptic obovate, green. Petiole slender, cauline stipules $\frac{3}{4}$ -1 in., ovate or oblong, lower entire, upperlobed. Flowers pedicelled in dichotomous panicles, $\frac{2}{3}$ -1 in. diam., petals obcordate, purple. Fruiting pedicels sometimes 3 in., divaricate. Calyx-lobes acute; bracteoles obtuse. Achenes very numerous, minute, wrinkled on a globose, hairy receptacle.

Use :—The roots are officinal, being considered depurative. They are used externally in the Yunani system, the ashes being applied with oil to burns (Dr. Stewart).

471. *P. supina*, Linn. H.F.B.I., II. 359.

Syn. :—*Comarum flavum*, Roxb. 409.

Habitat :—Throughout the warmer parts of India, from Kashmir to Malacca and the Nilghiri Hills.

Root annual. Stems very numerous from the root. 6-18 in., hairy, spreading, leafy dichotomously branched, prostrate or suberect, stout or slender. Leaves pinnate, $\frac{1}{2}$ -3 in., flaccidly

membranous. Leaflets 3-9, opposite and alternate oblong, obtuse, lobate or serrate. Stipules ovate entire, very broad or narrow. Petiole slender $\frac{1}{2}$ -2in., pedicels axillary, solitary, slender, $\frac{1}{8}$ - $\frac{1}{2}$ in. Calyx-lobes obtuse or acute, as are the bracteoles. Petals smaller than the calyx, oblong, yellow. Achenes very many, minute, smooth or rigid; receptacle globose, villous; style subterminal.

Use:—The roots are employed in Sind as a febrifuge (Murray, 143). The medicinal properties depend upon tannin; they are astringent and tonic (Dymock).

472. *Agrimonia eupatoriūm* Linn. H.F.B.I., II. 461.

Syn.:—*A. nepalensis*, Don *Prodr.*

English:—Agrimony.

Habitat:—Temperate Himalaya, from Murree and Kashmir, altitude 3-10,000ft.; Sikkim, alt. 7-10,000ft.; Khasia Mts., 4-6,000ft. Mishmi Hills. Westwards from Persia to the Atlantic, Siberia and Java. N. America. Java? (J. W. Hooker).

A slender, erect, leafy perennial herb. Rootstock woody, short or long. Leaves 4-7in. Leaflets 6-21, sessile, alternate, often small hairy on both surfaces, larger 1- $\frac{1}{2}$ in. elliptic-ovate or obovate rarely orbicular; smaller often orbicular and minute; petiole slender. Stipules large, leafy, lunate entire or toothed. Racemes slender, lengthening in fruit; pedicels reflexed in fruit; bracts 3-fid or 3-partite. Flowers $\frac{1}{2}$ in. diam. Petals oblong-ovate, yellow. Calyx-tube $\frac{1}{2}$ in., hardened in fruit, grooved, lobes conniving in fruit; top of tube with a dense ring of spines which become hooked in fruit and are erect, with the outer spreading.

Use:—From the remotest times Agrimony has enjoyed a high reputation among the herbalists of Europe; it is strange that it should be apparently quite unknown to the native doctors of India. The root is a powerful astringent, a useful tonic, and a mild febrifuge (Watt).

473. *Rosa damascena*, Mill. H.F.B.I., II. 364.

Vern.:—Gulāb; Sudburg (H. and Bomb.); Gulāppā irro-

jappu (Tam.); Gulâb-kali (the flower buds.) (Guz. and Mar.); Gulâb, gul, gulâb (Pushtu.)

Habitat:—The commonest Indian Garden Rose, cultivated for Attar. Native country unknown.

Prickles unequal, large, hooked, sepals reflexed in flower.

Use:—In India, rose buds are preferred for medicinal use, as they are more astringent than the expanded flowers; they are considered to be cold and dry, cephalic, cardiacal, tonic and aperient, removing bile and cold humors. Externally applied, the petals are used as an astringent. The stamens are thought to be hot, dry and astringent, and the fruit is credited with similar properties. A conserve made from equal parts of rose petals and white sugar beaten together, known as *gulkand*, is considered tonic and fattening, and is much used by women and old people. Shaikh-el-Rais says that he cured a consumptive young woman with it (Dymock).

474. *R. centifolia* Linn. H.F.B.I., II. 364, *Roxb.* 404.

Vern.:—Gulâb (H.); Golâp (B.); Groja (Tam.); Roja (Tel.); Paninir (Mal.); Gulabi (Kan).

Eng.:—The Hundred-leaved or Cabbage Rose.

Habitat:—A native of Caucasus and Assyria, cultivated in India.

Styles distinct. Stem erect, prickles mixed with the glandular bristles, unequal, large, hooked, bristles numerous; leaflets and calyx glandular-ciliate; flowers nodding.

Parts used:—The Petals and Oil.

Use:—The petals are said to be mildly laxative. The oil or the attar of roses is employed in medicine to disguise the unpleasant odor of certain ointments, and other external applications. The petals are given in the form of a syrup as a laxative to infants (Watt).

475. *R. Gallica* Linn. H.F.B.I., II. 364.

Habitat:—Europe and Asia Minor. Cultivated in India.

Style distinct. Stem erect, prickles mixed with glandular bristles, slender, equal. Flowers erect.

Use:—The dried petals are slightly tonic and astringent, and useful in debility. They are officinal in the Indian and British Pharmacopœias.

476. *R. alba* Linn. H.F.B.I., II. 364.

Vern:—Swet or Sevanti gulâb (H. and B.); Gul-seati (Pb.)

Syn:—*R. glandulifera*, Roxb. 407.

Habitat:—Cultivated in India.

Caucasus, Afghanistan? (J. D. Hooker).

Leaflets 5-7, large, grey, rugose, downy and pale beneath. Flowers large white pale, or bluish, double. Sepals often pinnatifid.

Use:—The flowers are used as a cooling medicine in fevers, also in palpitation of the heart (Baden Powell.) The petals made into *gulkand* in Poona (a preserve with cane-sugar).

477. *Cydonia vulgaris* Pers, H.F.B.I., II. 369.

Syn:—*Pyrus cydonia*, Linn. Roxb. 406.

Vern:—Bihî (H.); Bamsunt, bamsutu (Kashmir); Shimai-madala virai (Tam.).

Eng:—The Quince.

Habitat:—Cultivated in N.-W. India.

A large shrub; branchlets, underside of leaves, peduncles and calyx white-tomentose. Wood light brown, soft, even-grained. Leaves ovate from an obtuse base, entire; petioles short, stipules oblong, obtuse, glandular-serrate. Flowers white, 2 in. across. Calyx-lobes leafy, glandular-serrate, longer than tube. Fruit large, clothed with grey, woolly tomentum; 5-celled; endocarp cartilaginous. Seeds many, testa mucilaginous. Flowers in March and April.

Parts used:—The seeds.

Use:—The sweet and sub-acid quinces are commonly eaten as a fruit by the Arabs and Persians, and are considered cephalic, cardiacal and tonic. The leaves, buds and bark of the tree are domestic remedies among the Arabs on account of their astringent properties. In India, the seeds are considered cold, moist, and slightly astringent, and are one of the most popular remedies in native practice, the mucilage being

prescribed in coughs and bowel complaints as a demulcent; externally it is applied to scalds, burns and blisters (Dymock).

The seeds act as demulcent, and are used by the natives in diarrhoea, dysentery, sore-throat, and fever. The dried fruit is used as a refrigerant (Watt).

Fatty oil of seeds.—Seeds were ground, dried carefully, and extracted with ether, chloroform or light petroleum; fresh seeds yielded 15.3 per cent. of oil. This oil was yellow and had a faint odour of oil of almonds; it had a solidification point—13.5°, sp. gr. 0.922 at 15° solubility 4.15 parts in 100 of 95 per cent. alcohol, index of refraction 1.47248 for green, 1.47292 for red, viscosity 16.4 at 17° (by Schubler's method, comparing its velocity of efflux with that of water); it was optically inactive and showed obscure absorption bands in the blue and violet. 1 gram neutralised 31.7 milligrams K. O. H. in the cold ("acid number"), 181.7 on heating ("Koettstorfer's" or "saponification number"); 5 grams contained volatile acids, soluble in water sufficient to neutralise 0.508 c.c. N./10 K. O. H. solution ("Reichert-Meißl number"); it contained 95.2 per cent. of fatty acids, insoluble in water "Hehner's number"), and united with 113 per cent. of iodine ("Hübl's iodine number").

By hydrolysis of the oil with lead oxide, glycerol was obtained to the extent of 4.1 per cent. A larger quantity of the oil was hydrolysed with caustic soda, and the acids converted into calcium salts, which were then treated with ether. From the calcium salt, soluble in ether, a liquid acid was obtained, and purified by conversion into its ethylic salt and fractional distillation of the latter. This acid has a sp. gr. 0.8931 and composition OH. $C_{17}H_{32}COOH$; its ethylic salt boils at 223–226° under 7.5 mm., pressure; an anhydrous barium salt, melting at 79°, and a monacetyl derivative were prepared; a dibromide, $C_{18}H_{34}O_3Br_2$, was also prepared, and the acid was found to darken in the air, absorbing oxygen. From the calcium salt, insoluble in ether, a mixture of solid acids was obtained from which two were separated by crystallisation from 70 per cent. alcohol; these were myristic acid, the main product, and a small amount of an acid which melts at 42°, contains C. 75.1 and H 12.1 per cent., and is possibly an isomeride of pentadecylic acid. (J. Ch. S. 1899 A. I. 822).

Pectin from Quince. This pectin is strongly dextrorotatory, $[\alpha]_D = 181.2^\circ$. On hydrolysis with dilute sulphuric acid, it yields arabinose; when treated with nitric acid, it gives mucic acid, and with diastase from germinated barley it behaves exactly like the pectin obtained from the gentian and the gooseberry.—(J. Ch. S. 1899 A. I. 822).

478. *Eriobotrya japonica*, Lindl. H.F.B.I., II. 372.

Vern.:—Logat (H.).

Habitat:—The tree is indigenous in China and Japan. The fruit of Saharanpur is especially in repute, says Gamble. It

is an ornamental tree. Much cultivated at Dehra Dun and Saharanpur and in other parts of Northern India.

I used to see a solitary tree grown in the Thana Jail garden, in the early eighties, from seed sent by my friend Mr. W. F. Sinclair, I. C. S., Collector of Colaba, over 25 years ago, from Alibag, Colaba District. He subsequently was Collector of Thana in 1894, and used to highly admire the tree for its beauty and healthy and rapid growth in foreign soil. (K. R. Kirtikar.)

A middle-sized tree, bark thin, dark-grey. Wood pink, hard, close-grained. Branches very robust, as thick as the little finger. Leaves beneath and inflorescence softly densely woolly, subsessile, narrowly oblanceolate, acuminate, nerves 10-15 pair, strong beneath (Kanjilal). Hooker says the leaves are 6-8 by 1½-3 in., nerves 12-15 pair. Petiole very short, woolly. Flowers dull white, dense, fragrant, ½ in. across, in terminal panicles which latter are 3-6 in. long and broad; branches very stout. Calyx-tube short; lobes ovate, subacute, petals broadly ovate. Fruit ovoid intruded at top, pyriform or globose, baccate, 1-1½ in. or even 2 in. long, yellow or orange when ripe. Seeds 2-5, dark-brown, smooth, sessile.

Flowers in August to November and December. Fruits in March and April.

Uses:—Dr. Peokolt finds that the leaves taken in infusion, in the proportion of 30 grams to 240 grams of water, in the dose of a tablespoonful every two hours, produce a good effect in diarrhoea. The tincture of the leaves is employed in indigestion (Ph. J. Jan. 30th, 1886.)

The seeds contain 0.35-0.45 p. c. of fat. Specimens of the fat, prepared by pressing (I), and by extraction with ether (II), and of the fatty acids (III) separated therefrom, had the following characters:—Sp. gr. at 15°C., I. 0.967; m. pt. I. 49°, II. 48°C.; refractometer reading at 45°C., I. 75.5, II. 76; acid value, I. 90.5, II. 89.5; III. 160; Saponification value, I. 179.9; III. 173; Hehner value, I. 92.6, II. 92.2; Reichert-Meissl value, I. 5.4; iodine value, I. 48.7, II. 48, III. 58.5. The product obtained by the oxidation of the liquid fatty acids by Hazura's method (permanganate, in alkaline solution) yielded to ether, dihydroxy stearic acid of m. pt. 234.5°C.; the residue melted at 154°-154.5°C. Archidic and palmitic acids were detected in the solid fatty acids. J. Ch. I., 15th February 1911, p. 140.

N. O. SAXIFRAGACEÆ.

479. *Saxifraga ligulata*, Wall, H.B.F.I., II. 398.

Vern.:—Pakhan-bed; Silphora (H.); Batpia, popal, shafrochi, banpatrak, dakachru (Pb.); Pâshânbheda (Bomb.); Kamarghwal (Pushtu).

Habitat:—Temperate Himalaya, from Bhotan to Kashmir, and the Khasia Mts.

Perennial herbs. Rootstock stout. Leaves ample, undivided, with a large sheath at the base of the petiole; 2in.-1ft. in diam.; glabrous on both surfaces, dotted on the lower; scape corymbose, 6-18in. high. Petals white or red, rose or purplish, $\frac{1}{2}$ -1in. long, orbicular, with a claw of variable length. Calyx-lobes erect in fruit. Fruit sub-globose; styles very long. Capsles sometimes three-seeded, much larger than in any of the other species, elongate, sub-pyramidal, smooth.

Part used:—The root.

Use:—The root is used as a tonic in fevers, diarrhœa and cough, and also as an antiscorbutic. It is bruised and applied to boils and also in ophthalmia. It is also considered absorbent and given in dysentery (Atkinson and Dr. Stewart). In Sind, the root is rubbed down and given with honey to children when teething. (Murray.)

480. *Dichroa febrifuga*, Lour. H.F.B.I., II., 406.

Syn.:—*Adamia cyanea*, Wall.

Vern.:—Basak, bansûk asern Nepal; Gebocanak (Lepcha); Singnaamûk (Bhutia.)

Habitat:—Temperate Himalaya from Bhotan to Nepal and Khasia Mts.

An evergreen shrub, 5-9ft. high, somewhat virgate. Bark yellow, peeling off in flakes; wood white, moderately hard; young offshoots and inflorescence pubescent, with short hair. Leaves opposite 3-8in., lanceolate, blade 3-8, tapering into the petiole, $\frac{1}{2}$ -1in. long; pubescent or puberulous on the nerves, otherwise glabrous, usually narrow, sometimes obovate-lanceolate. Petals 5 or 6, thick, valvate, $\frac{3}{16}$ in. long. Ovary $\frac{3}{4}$ inferior

Ovules numerous, on 3-5 parietal placentas. Berry finally bright intensely dark-blue.

Use.:—The shoots and the bark of the roots are made into a decoction and used as a febrifuge by the Nepalese (Watt).

"It appears to have no active effects, unless it be taken in large quantity in the form of decoction. The natives take it in doses large enough to make them sick, and so indirectly to cure the fever."

481. *Ribes orientale* Poir. H.F.B.I., II. 410.

Syn.:—*R. Villosum*, Wall. Roxb.

Vern.:—Nanghe; Phulanch (Chenab); Askûta (Laduk.); Gwâldakh, Kaghak (Kaghan) (N.-W. P.); Yange (Spiti).

Habitat:—Kashmir and Baltistan.

A shrub 6ft. high, polygamo-dioecious, unarmed, sticky, glandular and minutely hairy. Leaves round-reniform, crenate, obscurely 3-5-lobed, 1-1½ in. diam. Bracts ½ in. long, linear, often exceeding the pedicels. Racemes erect somewhat dense in flowers, lax and pendant in fruit. Flowers small, greenish. Calyx-tube hardly produced above the fruit. Berries glandular-pubescent, ½ in. diam; roundish yellow or reddish.

Use:—The berries taken one or two at a time, are considered by the natives an excellent purgative (Aitchison.)

N. O. CRASSULACEÆ.

482. *Bryophyllum calycinum*, Salisb. H.F.B.I., II. 413.

Syn.:—*Cotyledon rhizophylla*, Roxb. 388.

Vern.:—Kop-pâtá (B.); Zakhm-haiyat-ká-pattá (Duk.); Malai-kalli, runá-kalli (Tam.); Sima-jamudu (Tel.); Elamarunna, elamarunga, murikuti (Mal.); Lonua-hadakana-Jidâ (Kan.); Ghaimári, aranmaran, Ahirâvan-Mahirâvan (Bomb.)

Habitat:—Throughout the tropical plains of India, universal in Lower Bengal.

A perennial, succulent, glabrous herb. Stem erect, hollow, 1-4ft. Leaves usually simple, rarely compound, with 3 leaflets, opposite-stalked, fleshy, ovate or oblong, 3-6in., crenate, obtuse.

Flowers pendulous, cylindric, 2in. long, in a large terminal panicle. Calyx tubular, inflated, green, tinged with red and spotted with white, 4-toothed. Corolla tubular, twice as long as the Calyx; tube cylindric, green, lobes 4, tinged with red, acute, spreading. Stamens 8, in 2 series, inserted about the middle of the Corolla-tube. Carpels 4. Follicles 4, many-seeded, enclosed within the dry persistent Calyx and Corolla. (Collett).

Sutlej Valley; Simla; throughout India. An introduced plant, spread throughout all tropical regions. Often much cultivated in gardens in Bombay and in the Dekkan. In Ceylon, says Trimen, it is a common plant on bare rocky places throughout the low and lower montane country. Believed to be a native of Tropical Africa.

Use:—The leaves slightly toasted are used by the natives as an application to wounds, bruises, boils, and bites of venomous insects. In the Concan the juice of the leaves is administered in $\frac{1}{4}$ to $\frac{1}{2}$ tolá doses, with double the quantity of *ghi*; in dysentery. I have seen decidedly beneficial effects follow their application to contused wounds, swellings, and discolorations were prevented, and union of the cut parts took place much more rapidly than it does with the ordinary treatment by water dressing (Dymock).

Used in the form of poultice and powder for sloughing ulcers, it is a disinfectant (Surg. Barren, in Watt's Dictionary, Vol. I.)

483. *Kalanchoe spathulata*, DC., H.F.B.I., II. 414.

Syn.:—K. Varians, Wall.

Vern.:—Tatára, rungru, haiza-ka-patta (Pb. and H.); Hátho Kâne (Nepial); Pátkuári, bakal patta (Kumaon).

Habitat:—Tropical Himalaya, from Bhotan to Kashmir.

An erect, stout, perennial herb. Stems 4ft. high. Leaves glabrous, spathulate-oblong, crenate, upper distant and becoming very narrow, sometimes 3-foliate, with the petiole often 3-4 by $\frac{1}{2}$ in., frequently sessile; lower commonly 3-4, sometimes 10in., long, besides the petiole. Lowest bracts linear, narrow,

trifoliate, upper few, scattered, linear, $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Corymb flattish or more rarely elongate. Flowers clear, yellow; the Corolla-tube glabrous. Calyx in fruit often as much as $\frac{3}{8}$ in. wide, 4-partite, elongate. Corolla, with a flask-shape tube and spreading 4-fid limb, much exceeding the Calyx, persistent. Stamens 8, in two series, adnate to the Corolla-tube, hypogynous scales 4, linear. Carpels 4, adnate to the base of the Corolla-tube, attenuated into long styles; ovules very many. Follicles 4, seeds very many, oblong, ellipsoid, with 8-15 longitudinal ribs.

Part used :—The leaf.

Use :—It is poisonous to goats, and the leaves are, at Lahore, reckoned a specific for cholera. In Kangra, they are burned and applied to abscesses. (Stewart).

484. *Kalanchoe laciniata*, DC., H.F.B.I., II. 415.

Syn. :—*Cotyledon lanciniata*, Roxb. 388; *K. teretifolia*, Haw.

Sans. :—Hemságara (Sea of Gold).

Vern. :—Tukhmhyát, Parna-bij (Bomb.); Mala-kullie (Tam.).

Habitat :—Tropical regions of the Deccan Peninsula, in Bengal, at Patna and Dacca.

A suffruticose, fleshy plant. Leaves opposite, pinnatifid-laciniate, the lobes thick, entire, sub-serrate or dentate. Cymes paniced. Calyx 4-partite, sepals lanceolate, acuminate, spreading. Corolla hypocrateriform; tube cylindrical; limb spreading, 4-partite. Carpels 4; styles filiform.

There are 3 varieties.

Uses :—The succulent leaves are valued as an application to wounds and sores; they allay irritation and promote cicatrization. In the Concan, the juice of the leaves is given in bilious diarrhoea and lithiasis. (Dymock).

I can myself speak of their good effects in cleaning ulcers and allaying inflammation (Ainslie).

The juice is used externally in bruises and burns, also to cure superficial ulcers. As a styptic it is used on fresh cuts and abrasions (Thornton in Watt's Dictionary).

Malic acid from Crassulaceæ.—The acid was prepared chiefly from *Echeveria secunda glauca* and *Sedum purpurescens* (*Bryophyllum calycinum* yields more, namely, about 0.23 per cent. of the leaves, but is less easily obtainable) by extraction with boiling water, precipitation of the lead salt and decomposition of this with hydrogen sulphide. The residue left on evaporation of the aqueous solution, when dried at 110° until constant in weight, has the composition $C_3 H_3 O_3$; it represents an anhydride of the acid, for the salts prepared from it are derived from a dibasic acid, $C_4 H_4 O_5$. The calcium hydrogen salt is usually amorphous, but was once obtained in regular octahedra with $6 H_2 O$; the corresponding salt of ordinary malic acid crystallises in rhombic octahedra. The barium salt is anhydrous, whereas ordinary barium malate crystallises with $1 H_2 O$. The silver salt is anhydrous, whereas ordinary silver malate contains $5 H_2 O$. The lead salt crystallises with $3 H_2 O$. No ammonium hydrogen salt could be prepared, whereas ordinary malic acid forms a well crystallised salt of this composition. The dimethylic salt was prepared from the anhydride and methylic alcohol by Anschütz's method; it distils at 162° under 25 mm. pressure: after this has passed over, a second product was obtained, to which reference will be made later.—J. Ch. S. 1898 A.I., p. 513 et seq.

N. O. DROSERACEÆ.

485. *Drosera peltata*, Sm. H.F.B.I., I. 424.

Vern.:—Mukha-jali (H.); Chitra (Pb.)

Habitat:—Throughout India.

A perennial herb. Stem erect, leafy, 3-12 in. high, simple or corymbose upward. Leaves alternate, long-petioled, lunate-peltate. Racemes subterminal. Pedicels $\frac{1}{2}$ - $\frac{1}{2}$ in. long. Flowers white, sepals ovate, glabrous, erose or fimbriate. Styles 3, fimbriate. Seeds obovoid. Testa prominently reticulated.

Part used:—The leaf.

Use:—The leaves of this curious and insectivorous plant, bruised and mixed with salt, are used as a blister in Kumaon. This same practice prevails, however, in Kanáwar, without the use of salt. All the members of this family have a bitter, acrid and caustic flavor. If placed in milk they rapidly curdle it (Watt).

N. O. HAMAMELIDEÆ.

486. *Altingia excelsa*, *Noronha*, H.F.B.I., II.
429.

Syn. :—*Sedgwickia cerasifolia*. Griffith.

Vern. :—*Siláras* (H.); *Jutili* (Ass.); *Neri-uriship-pál* (Tam); *Rasa-mála* (Mal.); *Shila-rasam* (Tel. Guz. and Mar).

Habitat :—Extending from East Bengal to China and Malay. Assam and Bhutan, Pegu, Mergui, Java, Yunnan.

A tree, 60-100ft. high. Leaves alternate, 3-4½in., elliptically-lanceolate, glabrous, acuminate on both surfaces, or with tufts of hairs in the axils of the nerves beneath. Petiole 1-1½in. Flowers in dense heads; heads wrapped by a large bract, male racemose, female solitary. Male heads: a mass of stamens with very short filaments, probably representing numerous achlamydeous flowers. Anthers obverse—pyramidal, the valves when young turned in till they reach the connective, so that the young stamen is pseudo—4-celled, dehiscing longitudinally. Female heads of 12-20 flowers; calyces confluent, without limb. Petals 0 (some rudimentary stamens have been taken for petals). Ovary ¾-inferior, 2-celled; styles 2, separate, deciduous. Ovules numerous, axile. Fruit-head globose, harsh. Seeds numerous; lowest 1-2 of each cell winged, fertile, the upper without wing or embryo.

Uses :—Yields the resin known as "storax." In orchitis, it is not possible to use this semifluid resin on the inflamed testicle direct, but it is used over the scrotum and covered over with dry tobacco-leaves. I have used it with success in the early stages of Hydrocele of the tunica vaginalis. (K. R. K.).

It contains benzaldehyde, cinnamic acid and cinnamaldehyde, also a resin and a pentosan; esters are not present.—J. Ch. S. 1902, XI. 111.

Oriental storax is a mixture of free cinnamic acid, vanillin, styrol, styracin, cinnamic acid—ethyl ester, cinnamic acid—phenolpropyl ester, and storesinol, partly in the free state and partly as cinnamic acid ester. Storesinol has the composition $C_{16}H_{26}O_2$, and melts at 156°—157°; it is isomeric with the benzoiresinol, isolated from benzoin, which melts at 272°C.

The composition of American Storax deviates so insignificantly from Oriental Storax that they may be regarded as identical. *The Agricultural Ledger*. 1904—No. 9 p. 120.

N. O. RHIZOPHORACEÆ.

487. *Rhizophora mucronata*, Lamk. H.F.B.I., II.
435.

Syn.:—R. Mangle, Willd. *Roxb.* 389.

Vern.:—Bhorar (B.); Upoo-punna, adair-pouna (Tel.); Rai (Uriya); Kamo, kimro (Sind.) Kândel, hariya (Bomb.).

Habitat:—Tidal shores, from the mouths of the Indus to Malacca and Ceylon. Bombay, Western Coast, Bandra (K. R. K.)

A small, evergreen tree, of muddy shores and tidal creeks of India, Ceylon, Burma and the Andaman Islands, sending down numerous aerial roots into the mud of the mangrove swamp. The lower part of the trunk dies early, and the tree is then supported by a number of branching aerial roots, standing, as it were, on stilts. Bark brown, fairly smooth, with vertical clefts. Sapwood light-red; heartwood dark-red, extremely hard, splits and warps a little in seasoning (Gamble). Leaves elliptic mucronate by the excurrent midrib, 3-7 by 1½-4in., narrowed at base. Stipules large, deciduous, enclosing the buds. Petiole 1-1½in. Cymes 3-5-fid, from the axils of the current year's leaves. Peduncles 1-1½in.; "longer than the petioles," says Mr. Henslow, about 3-flowered; pedicels short, thick. Flowers more or less drooping. Calyx-segments 4, irregular, narrowing upwards, ½in., oblong-lanceolate, keeled within, persistent and enlarged in fruit. Petals hairy within, shorter than the Calyx-limb, subconnivent, coriaceous, margins involute. Anthers 8. Fruit 1½-2in. long, dark brown, embryo often attaining 30in. before falling from the tree. "The seeds often germinate while yet on the tree and drop as young plants into the mud below. The roots also progress and form constantly fresh stems supported by the buttressed roots standing out of the mud." (Gamble).

Use:—The bark has been tried medicinally in cases of hæmaturia.

(For notes on the medicinal utilization of the astringency of this tree, see Ph. J. for 1st Sept., 1888; p. 179).

488. *Ceriops Candolleana*, Arn. H.F.B.I., II. 436.

Vern.:—Kirrari; Chauri (Sind); Goran (B.).

Habitat:—Tidal forests, &c., from the mouths of the Indus to Malacca and Ceylon.

A small, evergreen tree, in the tidal forests of Sindh, the Western Peninsula, Bengal, Ceylon and the Andamans, Sea coast of Tropical Asia, Africa and Australia. "A simple stemmed shrub" almost reaching 25ft. in height, with a girth of 18in. (Schlich), and many buttresses at base" (Gamble). Bark dark-red. Wood orange-red, hard. Leaves 2-3 by 1-2in., ovate, very obtuse, cuneate or attenuate at the base. Cymes peduncled, branching, pedicels short. Calyx 5-cleft, lobes linear acute; petals 5 glabrous emarginate tip with 3-4 capitate bristles. Stamens 10, alternately shorter; filaments much longer than the anthers. Ovary half-inferior, 3-celled. Style short, stigma simple. Fruit small, club-shaped or subovate, surrounded near base by the reflexed segments of the calyx.

Parts used:—The bark and shoots.

Uses:—The whole of the plant abounds in an astringent principle. The decoction of the bark is used to stop hæmorrhage, and applied to malignant ulcers. On the African Coast, a decoction of the shoots is used as a substitute for quinine. (Watt).

489. *Kandelia Rheedii*, W. and A. H.F.B.I., II. 437.

Vern.:—Guria (B.); Rasunia, rasuria (Uriya).

Habitat:—Bengal, Burma and the Western Coast.

An evergreen shrub or small tree, with a simple stem. Bark $\frac{1}{4}$ in., spongy, red-brown, peeling off in small flakes. Wood

soft, close-grained, reddish-brown. Leaves 2-4 by 1-2 in., elliptic-oblong, narrowed into petiole, 1-2 in. long, quite entire, dark-green above, reddish-brown beneath, glabrous. Peduncles about 1½ in., erect, twice-branched, dichotomously in cymes. Flowers white. Calyx surrounded at base by bracteoles, connate into a cup, lobes 5 or 6, linear, $\frac{1}{2}$ - $\frac{2}{3}$ in. long. Petals bifid, the lobes divided into numerous capillary segments. Stamens numerous, anthers small, filaments slender. Ovary half-inferior, prolonged beyond the calyx into a fleshy cone, one-celled. Ovules six, style slender, stigma 3-lobed. Fruit 1 in., conicovoid, girt at the base by the reflexed calyx-lobes.

Use:—The bark, mixed with dried ginger or long pepper and rose-water, is said to be a cure for diabetes (Rheede).

N. O. COMBRETACEÆ.

490. *Terminalia Catappa*, Linn. H.F.B.I., II. 444, Roxb. 380.

Sans.:—Ingudi.

Vern.:—Jangli-bâdâm (H. and Bomb.); Nattoo-vadamcottay (Tam.); Vadam (Tel.); Adamarram (Mal.); Taru (Kan.); Bâdâm (B.); Bengali-bâdâm, jangli-bâdâma, hât-bâdâm (Mar.)

Habitat:—Largely planted in all India, wild in the lowlands of Malaya and perhaps of the Transgangetic Peninsula.

A tall, deciduous tree. Branches horizontally-whorled. Stem often buttressed. Attains 80 ft. Wood red, with lighter coloured sapwood, hard. Leaves beautifully green, turning red before falling; clustered at the end of branchlets, glabrous; petiole and midrib more or less hairy, obovate from a narrow cordate base, 6-10 in. long, petiole short, stout and channelled. Flowers white, in slender axillary spikes, shorter than the leaf. Male flowers at the top, hermaphrodites below. Drupe glabrous, ellipsoid, somewhat compressed, keeled all round, 2 in. long, pericarp fibrous and fleshy, endocarp hard, oil expressed

from the seeds. The seeds are eaten, and so is the luscious and delicious sweet acid pericarp, greedily by children and even grown up persons.

Uses:—The kernels yield upwards of 50 per cent. of a pure bland oil, which may be substituted for almond oil. Kept for a long time, it deposits a large quantity of stearine. The bark is said to be astringent (Ph. Ind.).

The juice of the young leaves is employed in Southern India to prepare an ointment for scabies, leprosy, and other cutaneous diseases, and is also believed to be useful internally for headache and colic (Lisboa).

The seeds yield 63.43 p. c. of oil, which in odour, taste and color closely resemble true almond oil. The oil does not readily become rancid, but becomes thick on standing, and yields an abundant deposit of stearine.—J. Ch. I. for 31st August, 1910, page 1020.

Grimme obtained the following constants: Specific gravity at 15°, 0.9195; solidifying point, +7°; "D at 20°, 1.4682; acid value, 4.1; saponification value, 185.7; iodine value, 77. Insoluble acids and unsaponifiable, 93.95; unsaponifiable, 1.87. Fatty acids: Melting point, 48.49°; neutralization value, 198.6; iodine value, 73.5; mean molecular weight, 282.8.

491. *T. belerica*, Roxb. H.F.B.I., II. 445, Roxb. 380.

Sans.:—Vibhitaki.

Vern.:—Baherâ, bhairah (H.); Bohera (B.); Behada (Bomb.); Tanrik-kay, Tani, Kattu elupay (Tam.); Tani, tandi, toandi (Tel.).

Habitat:—Throughout India, common in the plains and lower hills.

A very large tree, with rusty pubescence on young branchlets and calyx; attains a height of 60-100ft.; trunk tall, erect, regularly shaped; branches spreading, forming a coppery-tinted, bright, broad-massive crown when young, bright-green when old. Youngest off-shoots beautifully crimson. Bark $\frac{1}{2}$ in. thick, dark or bluish grey, uneven and tessellated by broad longitudinal furrows, crossed by short, narrow, transverse wrinkles, the old bark exfoliating in dry corky scabs. Wood light grey or yellowish, open and coarse-grained, easily worked, but not

durable. Stem 6-10ft., at times 10-20ft. Leaves deciduous, exstipulate, alternate, crowded at the extremities of branches, crenulate, pubescent, broad, elliptic or ovate-elliptic, 3-8in. long, 2-3in. broad; base often unequal, the lower margin of the leaf tapering as it approaches the petiole and finally merges into the upper margin of the petiole, leaving the petiole slightly grooved at the ventral aspect. Apex obtuse, retuse, usually, sometimes acuminate, especially in the larger leaves; margin entire; main lateral nerves arcuate, prominent, 5-8, often reddish. Petiole roundish, longer than $\frac{1}{2}$ length of the leaf. The tree sheds its leaves from January to March. Flowers small; male and hermaphrodite on solitary, simple spikes, which are sometimes erect, sometimes bent, sometimes drooping; 3-6in. long, arising from the axils of fresh leaves, just before or about the same times of the year, as tender leaves shoot out. Roxburgh and Brandis condemn the flowers as of a dirty-grey or greenish colour; but the crimson markings of the Calyx and the soft down, as also the bright yellow anthers, are by no means unattractive, though the odour is offensive. Male flowers usually on the upper part of the spike, sessile. Hermaphrodite flowers chiefly confined to the lower part of the spike on short pedicels. Bracts linear, brown, very early caducous. Calyx deciduous. Corolla absent. Stamens 10. Filaments, 5 short, 5 long, arranged alternately, inserted below the Calyx-segments; the larger ones twice the length of the Calyx. In the hermaphrodite flowers there is an epigynous disk, brownish, densely hairy. Style slender, filiform, projecting slightly beyond the filaments. Stigma simple, a mere depression at the apex. Ovary tomentose, 1-celled, ovule pendulous from the apex of the cavity. Fruit 1in. long, ovoid-ellipsoid or globose, grey-velvety. Nut thick-walled and hard.

Uses:—Sanskrit writers describe beleric myrobalans as astringent and laxative, and useful in cough, hoarseness, eye-diseases, &c. As a constituent of *triphala*, or the three myrobalans, they are used in almost all diseases. The kernel of the fruits is said to be narcotic and astringent, and used as an external application to inflamed parts (Dutt).

Mahomedan writers describe it as astringent, tonic, attenuant, and aperient, useful in dyspepsia and bilious headache, also as an astringent application to the eyes (Dymock).

In the Concan, the kernel, with that of the marking nut, is sometimes eaten with betel-nut and leaf in dyspepsia; the fruit also is used as an astringent, usually in combination with chebulic myrobalans. There is no doubt about the narcotic properties of the kernel. The part used in medicine is the pulp (Dymock).

In the Punjab, it is chiefly employed in dropsy, piles, diarrhoea and leprosy; also occasionally in fever. When half ripe, it is considered purgative, when fully ripe or dried, astringent. Mixed with honey, it is employed as an application in cases of ophthalmia.

The oil is considered a good application for the hair. The gum is believed to be demulcent and purgative (Watt).

Like other kinds of *Terminalia*, the Beleric myrobalans afford a yellow fixed oil which is prepared by the poorer classes in the Central Provinces and used as a substitute for ghee and as an application for rheumatism. Bahada seeds yield about 25 per cent. of oil by expression which sells for 8 annas per seer. Two samples from Akola and Damoh had the following characters: Specific gravity, .9168, .9193; melting points 11°, 4°; acid values, 2.4, 3.0; saponification values, 205.8, 205.3; iodine values, 79.0, 85.3; Reichert-Meissl values, .76, .78; fatty acids and unsaponifiable, 94.2, 93.6 per cent., melting at 39° and 38°.

492. *T. Chebula*, Retz. H.F.B.I., II. 446, Roxb.

381.

Sans.:—Haritaki.

Vern.:—Hara, har, harara (H.); Haritaki (B.); Hilikha (Ass.); Silim (Lepch.); Karedha (Uriya); Hana, Silim-kung (Sikkim); Hardâ (Dec.); Kadukai-maram (Tam.); Karakaia (Tel.); Alale (Mysore).

Habitat:—Abundant in Northern India, from Kumaon to Bengal, and southward to the Deccan table-land.

A large or small deciduous tree. Bark $\frac{1}{4}$ in. thick, dark-brown, with numerous, generally shallow, vertical cracks. Wood very hard, brownish-grey, with a greenish or yellowish

tinge, with an irregular, dark-purple heartwood, close-grained, fairly durable. Branchlets, leaf-buds and young leaves, with soft shining generally rust-coloured hairs. Leaves distant, often sub-opposite, elliptic or ovate; secondary nerves 6-8 pair, arching, prominent; blade 3-8 in. long, petiole $\frac{1}{2}$ -1 in. long. Two glands or swellings on petiole near top. Flowers bisexual, $\frac{1}{8}$ in. across, sessile, dull white or yellow, with an offensive smell. Spikes sometimes simple, usually in short panicles, terminal and in the axils of the uppermost leaves. Bracts subulate or lanceolate, longer than buds, deciduous. Limb of Calyx cup-shaped, cleft half way into 5 acute, triangular segments, woolly inside. Fruit more or less distinctly 5-angled, obovoid from a cuneate base, sometimes ovoid or nearly globose, 1-1 $\frac{1}{2}$ in. long; shape and size of fruit varies accordingly.

Mr. Duthie writes:—"In Northern India the tree does not attain to any great size, but large trees, up to 100 feet in height, are often met with south of the Nerbudda."

Uses:—Sanskrit writers describe chebulic myrobalans as laxative, stomachic, tonic and alterative. They are used in fevers, cough, asthma, urinary diseases, piles, intestinal worms, chronic diarrhoea, costiveness, flatulence, vomiting, hiccup, heart-diseases, enlarged spleen and liver, ascites, skin diseases, &c. In combination with embelic and beleric myrobalans, they are extensively used as adjuncts to other medicines in almost all diseases. As an alterative tonic for promoting strength, preventing the effects of age and prolonging life, it is used in a peculiar way. (Dutt).

Mahomedan writers consider the ripe fruit as purgative, removing bile, phlegm and adjust bile. The unripe fruit is most valued on account of its astringent and aperient properties, and is a useful medicine in dysentery and diarrhoea. Ainslie notices their use as an application to aphthæ (Dymock).

"The fruits are used as a medicine for sore-throat, by the Paharias in Sikkim" (Gamble).

Recently M. P. Apery has brought to the notice of the profession in Europe the value of the drug in dysentery, choleraic

diarrhœa and chronic diarrhœa. He administers it in pills of 25 centigrammes each, the dose being from four to twelve pills or even more in the twenty-four hours (Pharmacog. Ind.).

It is therefore possible that the therapeutic value of myrobalans may before long form the subject of systematic investigation (Watt).

A fruit, finely powdered, is used as dentifrice. Said to be useful in carious teeth, bleeding and ulcerations of the gums (B. D. Basu).

A fruit, coarsely powdered and smoked in a pipe, affords relief in a fit of asthma. A decoction of the fruit is a good astringent wash. A fine paste, obtained by rubbing the fruit on a rough stone with little water, mixed with the carron oil of the Pharmacopeia and applied to burns and scalds, effects a more rapid cure than when carron oil alone is used (D. R. Thompson in Watt's Dic.).

Water in which the fruits are kept for the night is considered a very cooling wash for the eyes. The ashes mixed with butter form a good ointment for sores (Robb, in Watt's Dic.).

On removing the astringent pulp of the myrobalans a hard, stony seed remains which weighs 37.5 per cent. of the fruit. The seeds are sent in large quantities from the Central Provinces to Bombay as an oil seed. Within the seed is a kernel which yields to ether 36.7 per cent. of a yellowish, pleasant and edible oil. A sample of the oil had an acid value of 8.9, saponification value of 192.6, iodine value 87.5, and 96.2 per cent. of insoluble fatty acids and unsaponifiable matter.

Chebolic acid:—This is obtained from the fruits in the following manner:—The dried fruits are powdered, macerated for 10 days at the ordinary temperature with 90 per cent. alcohol, pressed and filtered. The alcohol is completely removed from the extract, and the residue then dissolved in hot water; cold water is added until no further milkeness appears, and the whole is allowed to settle, and then filtered. To the filtrate, sodium chloride is added until a permanent turbidity appears, and the solution is then shaken out with ethyl acetate, which dissolves chebolic and tannic acids. To remove the latter, the ethylacetate is distilled off, and the residue dissolved in water, and shaken out with ether; from the aqueous solution crystals of chebolic acid then separate on standing, and may be recrystallised from hot water. The yield is 3.5 per cent.

Chebolic acid, $C_{23}H_{24}O_{19} + H_2O$, begins to melt at about 200° , and is optically active, having $[\alpha]_D = +66.94^{\circ}$. The molecular weight of the anhydrous compound was determined by Beckmann's boiling point method

in acetone solution. The acid seems to be manobasic and forms an amorphous barium salt, $(C_{23}H_{23}O_{19})_2Ba$, which is white when moist, and green when dry, and a grey, amorphous, basic (?) Zinc salt, probably $(C_{23}H_{23}O_{19})_2Zn + ZnO$. These salts appear, in general, to be decomposed by water, even in the cold. With strychnine, an acid salt, $C_{19}H_{22}N_2O \cdot 2C_{23}H_{24}O_{19}$, is formed. With benzoic chloride and soda, a yellowish, amorphous benzoyl derivative, $C_{23}H_{20}BL_4O_{19}$, melting at 88.5° , is obtained. With phenylhydrazine, chebulic acid yields a derivative in the form of a reddish powder, which melts at 142° , and, when dissolved in alcohol and treated with strong aqueous potash, yields a momentarily green, then mulberry-red, and, finally, brownish-red coloration. (Tannic acid, similarly treated, gives a green colour, only gradually changing to red; gallic acid, an immediate red coloration). When chebulic acid is dissolved in alcohol, and the solution saturated with gaseous hydrogen chloride, some ethyl gallate is formed, and, in addition, a yellow, amorphous acid, somewhat analogous in its properties to tannic acid. Sulphuric acid hydrolyses chebulic acid to gallic acid and other undetermined products.—J. Ch. S. LXIV., pt. I. (1893), p. 212.

493. *T. citrina*, Roxb. H.F.B.I., II. 446. Roxb. 382.

Vern.:—Haritaki; Narra (B.); Hilika, Silikka (Assam.); Hortaki (Cachar); Hariha, Harira (U. P.)

Habitat:—Assam; East Bengal; Burma.

A large tree attaining 80ft. Leaves thickly coriaceous, elliptic lanceolate or oblong, subopposite, narrowed into a petiole $\frac{1}{4}$ in., blade 3-7in.; when adult glabrous, shining, the interstices of the nerves beneath, with sunk, close, white tomentum; the petiole usually with two glands at the top or on the base of the leaf beneath. Bracteoles linear, conspicuous on the young spikes. Spikes terminal and lateral, often paniced. Flowers all hermaphrodite. Calyx-teeth glabrous without, hairy within. Young ovary glabrous. Fruit narrow, lanceolate 2in. long.

Mr. C. B. Clarke remarks that *T. citrina* has a straighter stem, a brighter foliage and narrower fruits, but ought perhaps hardly to be reckoned a distinct species."

Use:—The medicinal properties are similar to those of the Chebulic myrobalan.

494. *T. Arjuna*, Bedd. H.F.B.I., II. 447.

Syn.:—Pentaptera Arjuna, Roxb. 382.

Sans.:—Arjuna; Kukubha.

Vern.:—Anjan, arjun, kahu (H.); Vella marda, Vellai-maruda-maram (Tam.), Ver maddi (Tel.); Sānmadat, arjun,

anjan, jamla (Mar.); Sâdado, arjun sâdado (Guz.); Maddi, tormatti, holematti, billi matti (Kan.).

Habitat:—Very common in the Sub-Himalayan tracts of the North-West Provinces and Deccan.

A large deciduous tree, with huge, often buttressed, trunk, attaining 60-80ft. Bark $\frac{1}{3}$ in. thick, smooth, pinkish grey, the old layers peeling off in thin flakes. Sapwood reddish-white; heartwood brown, variegated, with darker, coloured streaks, very hard. Glabrous; only the inflorescence is slightly pubescent. Leaves generally sub-opposite, hard coriaceous, oblong, sometimes spatulate-oblong, often campanulate blade 3-6, petiole $\frac{1}{4}$ in. long. Petiole rarely more than $\frac{1}{2}$ in., with two glands near its apex often very short. Flowers bisexual, dull, yellow, in erect terminal panicles. Bracteoles very small. Calyx-teeth nearly glabrous, both within and without. Young ovary very short, covered with crisped brown or rufous hair. Fruit lin. long, with 5-7 narrow angles, $\frac{1}{4}$ in. broad, irregularly marked with ascending lines.

Use:—The Sanskrit writers consider the bark to be tonic, astringent and cooling, and use it in heart diseases, contusions, fractures, ulcers, &c. In fractures and contusions, with excessive ecchymosis, powdered *arjun* bark is recommended to be taken internally with milk. A decoction of the bark is used as a wash in ulcers and chancres (Dutt).

The bark is astringent and febrifuge, the fruit tonic and deobstruent, the juice of the fresh leaves is a remedy for ear-ache.

The bark useful in bilious affections, and as an antidote to poisons (Baden-Powell's Punj. Prods.) In Kangra, the bark is used to sores, &c. (Stewart).

Regarding the physiological action of this drug, Dr. Lal Mohan Ghosh writes:—

(1) The drug (*Terminalia Arjuna*) acts as a cardiac stimulant and tonic, increasing the force of the beats of the heart, but slowing their number, but never completely stopping it. The diastole is more or less prolonged.

(2) The blood pressure is increased due to the contraction of the peripheral arterioles caused by the action of the drug on the vasomotor nerve possibly.

(3) It acts as a powerful hæmostatic; only drawback for this action is the rise of blood pressure.

(4) It helps diapedesis of red blood corpuscles.

(5) It slightly increases the excretion in the amount of phosphates and uric acid, but the increase is not very material to be taken into practical account.

Regarding its Therapeutic action, he says:—

The drug is a very valuable remedy in heart diseases, specially where a combined tonic and stimulant action is necessary. Thus in mitral disease, specially in later stages when the heart is feeble and flaccid, blood pressure low and the heart dilated, the drug may be administered with admirable effect. In aortic diseases the drug has one defect, namely, it increases the blood pressure, and the diastole is rather prolonged, but the force of contraction and the manner in which the aortic valves meet together may be utilised in these forms of aortic regurgitation that are caused merely by dilatation of the aorta, or in which the valves, although healthy, do not come in firm opposition, or in which the regurgitation is caused by weakness of the heart.

In exhausting diseases weakening the heart and increasing the frequency of the pulse the drug is invaluable, for, it does not exert the poisonous action of digitalis if long continued.

The drug may be used as a good local hæmostatic, but generally its use as a hæmostatic is doubtful on account of the rise of the blood pressure. In inflammations locally and generally it may be used by causing the contraction of the peripheral arterioles, and increasing the diapedesis, and at the same time improving the general circulation, the drug will relieve the inflammatory condition of the part. For this reason Chukradutta recommended it for all sorts of inflammatory conditions, and he goes so far as to say that it heals fractures, etc. For this reason it may be commended in pneumonic inflammations of lung, but directly it has no action on respiratory organs.

We have seen that for local inflammations the drug is very efficacious as in the experiments performed on inflamed eyes. There the inflammation soothed in one day although the cases were mild ones. The drug has been suggested to be lethontryptic, but except increasing slight amount of phosphatic and uric acid excretion this action of the drug is doubtful.

Chemical composition:—

An extract from the bark was prepared by heating 500 grms. of pulverised bark with 2 litres of water until only 500 c. c. of the fluid remained; the whole thing was then pressed through a fine muslin and the fluid part was again filtered through filter when a clear dark-reddish extract was obtained. The extract is sweetish to the taste, reduces Fehling's solution and assumes a dark black colour on treatment with ferric chloride and is acid to litmus. Part of it was treated with benzene in equal parts (being acidulated first with H_2SO_4) and a deposit separated out in the immiscible layer; the immiscible layer was then separated by means of separating funnel and benzene was allowed to evaporate. The residue left after evaporation was reddish-brown in colour and amorphous powder; it was insoluble in dilute HCl, but partly soluble in alcohol and ether. It does not give any reaction with Iodine, nor does it reduce Fehling's solution, but when heated with dilute HCl, it reduced Fehling's solution also gave ppt. with Phosphotungstic acid.

Thus we see that the extract when treated with benzene yielded a substance which is partially soluble in alcohol, and does not give any Iodine reaction, reduces Fehling's solution when heated with dilute HCl and is pptd. by phosphotungstic acid. From these facts we may conclude that the substance yielded from the treatment of the extract with benzene is glucosidal in nature, the glucosidal body was first made soluble in absolute alcohol, which was then evaporated, and a dry brown powdery residue was left; it also gave no reaction with Iodine, reduced Fehling's solution when heated with dilute HCl.

The extract was then treated with chloroform in the same way, and a gummy substance was obtained which either gave Orcin reaction nor reduced Fehling's solution even when heated with dilute hydrochloric acid.

The extract was then further treated with absolute alcohol when a reddish-brown-colouring matter was separated out.

It gave no reaction with petroleum ether. Tannic acid was estimated by Allen and Pleteker's method and total tannin (including glucotannic acid, etc.) obtained was 12 per cent.

The bark was then burnt and the ash yielded was 30 per cent., most of which was calcium carbonate, but traces of sodium carbonate and chlorides of the alkali metals was also obtained. Sugar estimated from the original solution was 17 per cent.

Thus we see that the extract from the bark yields—

1. Sugar.
2. Tannin.
3. A colouring matter.
4. A body glucosidal in nature.
5. Carbonates of calcium and sodium and traces of chlorides of alkali metals. (Food and Drugs No. 1 pp. 22 et seq.)

495. *T. tomentosa*, Bedd. H. F.B.I., II. 447.

Vern.:—Asan (H.); Piasal (B.); Ain (Bomb.); Kurruppu-maruta-maram (Tam.); Maddi (Tel.); Hatana, Matnak (Kol.); Ain, madat, yê, sâdada, sâj (Mar.); Ain (Guz.); Matti, kari-matti, banapu, tore matto-madi, aini (Kan.) Sâin (Bijnor); Sadar (Bundelkhand).

Habitat:—Very common in Deccan and the Sub-Himalayan tracts of the North-West Provinces, Nepal and Sikkim.

A large deciduous tree, trunk tall, regularly shaped. Bark rough, grey to black, with long, broad, deep longitudinal fissures and short, shallow, transverse cracks, inner substance red when fresh. Sapwood reddish white; heartwood dark brown, hard, beautifully variegated with streaks of darker colour, showing on a radial section as dark streaks which are generally undulating. Branchlets, inflorescence and young leaves clothed with short rust-coloured pubescence. Leaves coriaceous, hard,

elliptic or ovate, sometimes obovate-oblong; blade 5-9, petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long, nearly opposite, the uppermost often alternate; 1-2 glands near base of midrib; underside when full-grown, as a rule, soft tomentose, nearly glabrous, secondary nerves 10-20 pair. Flowers bisexual, dull yellow, in erect terminal panicles, the lower branches in the axils of leaves. Calyx-limb, a shallow cup, hairy within, segments 5, broad, ovate, acute. Fruit $1\frac{1}{2}$ -2 in. long, with 5 coriaceous brown wings, $\frac{3}{4}$ -1 in. broad, and marked with numerous horizontal lines running from the axils to the edges, which are thin and irregularly crenulate.

Use:—A decoction of the bark is taken internally in atonic diarrhoea, and locally as an application to weak indolent ulcers. (Ph. Ind.).

496. *T. paniculata*, Roth. H.F.B.I., II. 448.

Syn.:—Pentaptera Paniculata, Roxb. 384.

Vern.:—Kinjal (Bomb.); Pe-karakai (Tam.); Neemeeri (Tel.); Honal, huluvâ, hulve, hunâb (Kan.).

Habitat:—Malabar, lower hills, from Bombay to Cochin; Nilghiri and Kurg Mountains.

A very large deciduous tree. Bark $\frac{1}{4}$ in. thick, dark-brown, peeling off in flat flakes. Wood grey, with darker heart-wood, very hard, new growths rusty-tomentose. Leaves 4-7 in., subopposite, upper alternate, base cordate, two glands generally present near the base of the midrib beneath. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long, rusty-pubescent, sessile, close set in large spreading panicles, the front edge ovary growing out into a wing which is $\frac{3}{4}$ -1 in. broad.

Use:—The country people use the juice of the fresh flowers rubbed with Parwel root (*Cocculus Villosus*) as a remedy in cholera, and in poisoning with opium, 4 tolâs of the juice with an equal quantity of guava bark juice is given frequently. In parotitis, the juice with ghi and Saindhav (rock salt) is applied. In cholera, about 4 tolâs of the juice with an equal quantity of Parwel root is given every hour (Dymock).

497. *Calycopteris floribunda*, Lam. H.F.B.I. II. 449.

Vern.:—Bandi-murududu (Tel.); Bâguli, Ukshi (Mar.); Kokoranj (Hind.); Marsada, Baguli (Can.)

Habitat:—On hot hills, alt. 500-2,500ft., abundant throughout the Deccan, and from Assam to Singapore.

A large climbing shrub. Bark very thin, light brown, smooth. Wood soft to moderately hard, porous, light, reddish brown. Branches drooping, young shoots rusty-villous. Leaves opposite, ovate, shortly acuminate, entire. Flowers bisexual, in tomentose terminal and axillary panicles, free portion of Calyx infundibuliform, petals 0, stamens 10, inserted in two lines on the inside of the Calyx-tube, the 5 upper alternating with the Calyx-teeth. Fruit 5-ribbed, villous, $\frac{1}{4}$ in. long, surmounted by the enlarged Calyx, the segments of which are $\frac{1}{2}$ lin. long.

Parts used:—The leaves, root, and fruit.

Uses:—The leaves are bitter and astringent, and are chewed by the natives, and the juice swallowed as a remedy for colic. The root ground to a paste with that of *Croton oblongifolium* is applied to bites of the phoorsa snake (*Echis carinata*). In jaundice, the fruit and various spices, of each one part, are made into a compound powder, of which the dose is two māsas. The fruit, with the root of *Grewia pilosa*, is rubbed into a paste with honey and applied to ulcers (*Pharmacographia Indica*, Vol. II., p. 15).

498. *Anogeissus latifolia*, Wall, H. F.B.I., II. 450, Roxb. 384.

Syn.:—*Conocarpus latifolia*, D. C.

Sans.:—Dhava.

Vern.:—Dhāoya (H. and B.); Dhavadā; Dabria (Bomb.); Vallai-naga, vackelie (Tam.); Dinduga, dindlu, bejal, dindal (Kan.); Arma, yerma (Gond.). Bākli, Dhauri; Dhao (Bundelkhand).

Habitat:—Very common, from the Himalaya to Ceylon, not found in the Transgangeitic Peninsula.

A large deciduous tree, attaining 80ft., but usually a small tree. Bark smooth, whitish grey, $\frac{1}{8}$ in. thick, with shallow irregular depressions caused by exfoliation. Wood grey, hard, shining, smooth, with a small purplish, irregularly shaped, very hard heartwood; sapwood in young trees and young

branches yellow. Leafless during most of the hot season. Leaves broadly elliptic, pubescent when young, glabrous when full grown, blade $1\frac{1}{2}$ – $3\frac{1}{2}$, petiole $\frac{1}{4}$ – $\frac{3}{4}$ in. long, secondary nerves 8–14 pairs, tertiary nerves prominent beneath. Flower-heads $\frac{1}{4}$ – $\frac{1}{2}$ in. in diam., in on short peduncles, often in axillary racemes. Ripe fruit almost glabrous, nearly orbicular; sometimes $\frac{3}{8}$ (excluding the beak) by $\frac{1}{4}$ in., including the wings, usually smaller, more or less rusty pubescent when young.

Use:—This tree yields a valuable gum, which is worthy of attention (Dymock).

499. *Quisqualis indica*, Linn., H. F.B.I., II. 459, Roxb. 379.

Vern.:—Rangûn-ki-bel (H.); Vilayati-chambeli (Bomb.); Irangûn-malli (Tam.); Rangun-malle-chettu (Tel.).

Habitat:—Cultivated throughout India, wild probably in the Transgangetic Peninsula.

A large, climbing, woody shrub. Bark thin, grey, peeling off in small flakes. Wood, soft, porous. Young shoots pubescent or villous. Leaves elliptic or ovate-oblong, acuminate, those on leafy rambling shoots alternate, those on flowering branches opposite, petioles articulate, the portion below the articulation persistent, being hard and woody, hooking the branches on to the supports. Flowers showy, first white, then red or orange, then varnish-coloured, in different stages on one and the same flower stalk. Bracts leafy, ovate-lanceolate, free part of Calyx filiform, 2–3 in. long, hairy within and on the outside. Fruit seldom, never, I should say, met with in the Konkan, 1 in. long, glossy, with 5 deep furrows between the angles. I collected a half-ripe fruit, nearly half an inch long, in the beautiful Government Gardens of Sydney in 1889, March. It is still in my private Herbarium (K. R. K.).

Use:—In the Moluccas, the seeds are supposed to be anthelmintic. Four or five of the seeds are given with honey, as an electuary for the expulsion of entozoa in children (Ph. Ind.).

In Amboyna, the leaves are given in a compound decoction for flatulent distension of the abdomen. In China, the ripe seeds are roasted, and given in diarrhoea and fever (Rumphius).

N. O. MYRTACEÆ.

500. *Myrtus communis*, Linn, H. F.B.I., II. 462.

Vern.:—Vilâyati mehndi, mûrad (H.); Sutr-sowa, fruit: hab-ul-âs (Arab.)

Habitat:—Cultivated in India. This is the common myrtle, extensively grown in India. The leaves are extensively used by the European Jews in their religious ceremonials and by the Natives of India of all kinds for medicinal purposes. It extends from the south of Europe, especially the Mediterranean region, as far as Afghanistan and Baluchistan. In Bombay, it is a small shrubby plant, grown in gardens in pots and tubs.

The leaves are fragrant, opposite, sometimes ternate, ovate, smooth, of a beautiful green colour, glandular and persistent, with short petioles. Flowers axillary, 5-petulous, white, succeeded by a purple berry the size of a pea. (P. 333, The Bengal Dispensary, O. Shaughnessy 1841, Calcutta.)

Uses:—In Upper India, the leaves are considered useful in cerebral affections, especially epilepsy, also in dyspepsia, and diseases of the stomach and liver. A decoction is employed as a mouth-wash in cases of apthæ. The fruit is carminative, and is given in diarrhoea, dysentery, hæmorrhage, internal ulceration and rheumatism. The seeds, ground and mixed with antimony, are used to color the eye-lids (Watt).

"The essential oil of the leaves has been esteemed in France as a disinfectant and useful antiseptic, also used in the Paris hospitals, in certain affections of the respiratory organs and the bladder, and recommended as a local application in rheumatic affections" (Pharm. Journ., March 30, 1889: p. 782).

501. *Melaleuca leucadendron*, Linn, H.F.B.I., II. 465, *Roxb.* 591.

Vern.:—Kâyâputi (H.); Cajuputte, ilachie (B.); Kâyâkuti (Bomb.); Cajupûta (Mar.); Kijapûte, kayâpute (Tam.)

Habitat:—Cultivated in India.

A middle-sized evergreen tree. Bark white, thick, spongy, peeling off in papery flakes. Wood reddish brown, hard; branches slender, pendulous. Leaves alternate, coriaceous, lanceolate, more or less oblique, 2-5in. long, tapering into a short petiole, with 3-7 distinct longitudinal nerves. Flowers yellowish-white, sessile in erect axillary spikes, 2-6in. long, the rachis generally prolonged and leaf-bearing. Stamens numerous, the filaments united at their base into 5 bundles, inserted opposite to the petals. Ovary half-inferior, enclosed in the Calyx-tube. Capsule loculicidally 3-valved. Yields the Cajuput oil of commerce (Brandis).

Use:—The oil is used in medicine as a stimulant and diaphoretic (Gamble); it is used as an external application for rheumatism (Dymock).

It is antispasmodic; and, when externally applied, acts as rubefacient. It is also regarded as a powerful sudorific (Watt). The oil is officinal in British and Indian Pharmacopœias.

502. *Psidium Guyava*, Linn. H.F.B.I., II. 468, Roxb. 396.

Var. *pyriferum*, Linn. (sp.), and *pomiferum*, Linn. (sp.)

Eng:—The guava tree.

Vern:—Amrût, amrûd (Hind.); Piyara (Beng.); Amuk (Nepal.); Modharian (Ass.); Segapu (Tam.); Jama koia (Tel.); Lâl-jam, sùfêd-jam (Dec.); Tâmbadâ-peru, Pândharâ-peru (Bomb.)

Habitat:—A native of Tropical America and the West Indies originally; now quite naturalized all over India, Burma, Ceylon; almost wild.

A small evergreen tree or large shrub, 20-30ft. Girth 2-3ft. pubescent on the young branches. Bark smooth, thin, greenish grey, epidermis greybrown, peeling off in thin paper-like flakes (K. R. K.) Wood greyish brown, moderately hard, even-grained. Leaves opposite, oblong to ovate, on a very short petiole $\frac{1}{8}$ - $\frac{1}{2}$ in., usually acuminate or almost blunt, 3-5 or 6in. long, glabrescent above, adpressed pubescent beneath, lateral nerves 15-20.

pair, prominent parallel and very strong, with conspicuous transversal veins and net venation between. Flowers rather large, $1\frac{1}{2}$ in. across, solitary or by 2-3 or $\frac{1}{2}$ -2 in. long, pubescent peduncles, arising either solitary or rarely by 2-3 from the axils the leaves; "fragrant," says Kurz (Flora of Burma, Vol II, 477; not so in Bombay (K. R. K.) Bractlets under the Calyx 2, subulate. Calyx-tube ovoid or globular, densely puberulous, the lobes broadly ovate, acute, nearly as long as the adnate part; petals broad, fully $\frac{1}{2}$ in. diam. Fruit a large berry. The largest fruit I have seen is from Allahabad (K. R. K.), 4 in. in diam; ordinarily of the size of an apple or pear, fleshy, many-seeded, crowned by the Calyx-limb; when fully ripe, yellow and glossy. Pulp pinkish or white, edible, acid sweet.

Var. *Pyriferum* (P. *pyriferum* Linn). Peduncles 1-flowered; fruit pear-shaped.

Var. 2 *pomiferum* (P. *pomiferum*, Linn): Peduncles usually 2-flowered, with a third flower in the fork; fruits globular or ovoid.

Uses:—The bark of the root of Var. *pyriferum* is valued for its astringent properties, and has been employed with success in the diarrhoea of children. It is generally administered in the form of a decoction. The decoction serves a good deal in the prolapsus ani of children. The young leaves are used as a tonic in the diseases of the digestive functions. The bark of the Var. *Pomiferum* possesses similar properties. The decoction of the leaves has been used in cholera with some success, in arresting vomiting and diarrhoea (Pharm. Ind.).

The leaves when chewed are said to be a remedy in tooth ache.

An oil from the leaves is of a lemon-yellow colour, and has a faint aromatic odour; Sp Gr. at 15° C, 0.9157; $A_D = -10.5'$ (100mm.); $ND_{20} = 1.49638$; acid value, 2.0; ester value, 6.4; soluble in about 10 volumes of 90 per cent. alcohol.

[Schimmel's Report, April 1910, p. 123].

The leaves have the percentage composition:—resin, 3.15; fat, 5.99; volatile oil, 0.365; chlorophyll, 0.395; tannin, 9.15; mineral salts, 3.95; cellulose, 77.

The citron-yellow aromatic resin dissolves easily in chloroform, ether, or alcohol, melts at 189° and has the iodine number 115, acid number 89, and

saponification number 131. Alalis colour it yellowish-red, and strong sulphuric acid produces a brown mass. The fat is yellowish green, has a pleasant aromatic odour, and dissolves completely in chloroform, partially in ether or alcohol; it melts at 235°, and has iodine number 199, acid number 95, and saponification number 137.

The greenish-yellow volatile oil contains eugenol and dissolves in chloroform, ether, or alcohol; it boils at 237° and has a sp. gr. 1.069. Sulphuric acid colours it dark green, and bromine vapor orange-yellow. The tannin forms a brown amorphous powder, soluble in water and alcohol, giving a black precipitate with iron salts and reducing alkaline copper solution after boiling with dilute sulphuric acid. Calcium and manganese are present in the plant in combination with phosphoric, oxalic, and malic acids. (J. Ch. S. 1905 A I. 192).

503. *Eugenia jambos*, Linn. H.F.B.I., II 474, Roxb. 401.

Vern.:—Gulāb-jāmān (H.); Gulāb-jamb (B.); Golāpjam (Uriya); Jamu (Sind.); Jāmb (Deccan); Malle-nerale, pannerale (Coorg); Pannerali (Kan.).

Habitat:—East Indies.

A middle-sized tree. Wood brown, rather soft, with fairly regular, wavy, concentric lines of loose texture. Leaves thinly coriaceous, oblong or elliptic-lanceolate, narrowed towards both ends; blade 4-7 in., petiole $\frac{1}{4}$ in., secondary nerves and intra-marginal veins slender, but distinct. Flowers greenish-white, 2-3 in. across, in short terminal corymbs; composed of 2-4 pair of opposite flowers, those of the uppermost pair often opening first. Calyx-tube obconical, $\frac{1}{2}$ in. long; stamens $1\frac{3}{4}$ in. long, pedicel often as long as Calyx-tube. Fruit globose or pear-shaped, $1\frac{1}{2}$ -3 in. long, yellow or pink; edible, having the faint flavour of rose.

Use:—In Bhamo, Upper Burma, the leaves are boiled and used as a medicine for sore eyes (Watt).

504. *E. operculata*, Roxb. H.F.B.I., II. 498, Roxb. 398.

Vern.:—Rai-jāman, piāman, jamāwa, dugdugia, thuti (H.); Topa (Kol.); Totonopak (Santal.); Boteejam (Chittagong).

Habitat:—Sub-Himalayan forests, from the Jumna to Assam, Oudh and Gorakhpur forests; Cachar and Chittagong.

A large or moderate-sized evergreen tree. Leaves turning red in the cold season. Bark, grey or light brown, rough, with irregular hard scales, leaving cavities when they exfoliate. Wood reddish grey, hard, rough (Gamble). Branchlets subterete or 4-angulate. Leaves 3-8 by 2-4 in., opposite, subcoriaceous, soft, dots often black (in the dried specimens), rarely pellucid, broadly ovate or elliptic-rounded at the apex, or obtusely acuminate, narrowed below; lateral nerves 8-12 pair, prominent beneath, gradually fainter towards the margin, curving into a faint intra-marginal vein. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in., or even 1 in. Flowers tetramerous, small, greenish, odorous, subsessile. Cymes arranged in trichotomous lateral panicles below the current year's leaves, "mostly from scars of fallen leaves" (Duthie). Peduncles long, acutely-angled. Calyx campanulate, with short obtuse lobes, or nearly truncate. Petals united and falling off in one piece (operculum). Berry globose or ovoid, $\frac{1}{4}$ - $\frac{1}{2}$ in., rugose, juicy, edible.

Part used:—The fruit, root, leaves and bark.

Use:—The fruit is eaten for rheumatism, the root, boiled down to the consistence of *gur*, is applied to the joints by rubbing; the leaves are much used in dry fomentation; the bark is also employed medicinally (Revd. A. Campbell, in Watt's Dictionary).

505. *E. Jambolana*, Lam. H.F.B.I., II. 499, Roxb. 398.

Syn.:—*Sizygium Jambolanum*, D. C.

Sans.:—Jamboo.

Vern.:—*Jâman*, *jâm*, *jâmun* (H.); *Kâlâjâm* (B.); *Chambu* (Garo); *Jamu* (Ass.); *Naval*, *naga* (Tam.); *Nasodu*, *nairuri* (Tel.); *Jâmbûl* (Bomb.); *Jâmbûra* (Guz.)

Habitat:—Common throughout the plains of India.

A large evergreen tree, usually with a rather crooked stem and many branches. Bark 1 in. thick, light grey, with large patches of darker colour, smooth, with shallow depressions caused by exfoliation. Wood reddish grey, rough, moderately hard, darker near the centre, no distinct heartwood. Leaves, coriaceous, elliptic, or elliptic-lanceolate; blade 3-6 in., petiole $\frac{1}{4}$ -1 in.

long; secondary nerves numerous, slender, closely parallel. Flowers whitish, scented, sessile, in compound dichotomous cymes on the previous year's wood, rarely axillary. Calyx-tube turbinate, $\frac{1}{9}$ - $\frac{1}{4}$ in. long, base short, cylindrical, limb almost truncate, segments very short. Petals united in a calyptra. Stamens as long as the Calyx-tube. Fruit $\frac{1}{2}$ - $1\frac{1}{2}$ in. long, pink while ripening, beautifully purple almost to black when fully ripe, luscious, juicy, astringent to taste, but very agreeable when eaten quite ripe.

Parts used:—The bark, leaves, fruits and seeds.

Use:—The bark is astringent, and is used alone or in combination with other medicines of its class, in the preparation of astringent decoctions, gargles and washes. The fresh juice of the bark is given with goat's milk in the diarrhoea of children. The expressed juice of the leaves is used alone or in combination with other astringents in dysentery (Dutt).

The author of the *Makhzan* says that the fruit is useful astringent in bilious diarrhoea, and makes a good gargle for sore throat or lotion for ringworm of the head. The root and seeds are useful astringents, also the leaves. He tells us that a kind of wine is made from the fruit, and that the juice of the leaves dissolves iron filings, or, as he expresses it, reduces them to so light a condition that they float upon the surface of the liquid as a scum. This, when collected and washed, he recommends as a tonic and astringent (Dymock).

A vinegar, prepared from the juice of the ripe fruit, is an agreeable stomachic and carminative; it is also used as a diuretic.

Recently the seeds have been used in diabetes.

The seeds of *Eugenia Jambolana*, Lam. contain neither alkaloid nor enezyme. The alcoholic extract when distilled in steam yielded a small amount of a pale yellow oil, with the following characteristics: sp gr. 0° 9258 at 20°/20°C., $\alpha_D = 2^\circ 51'$ in a 50m. tube. The portion of the alcoholic extract insoluble in water contained the following substances: a mixture of fatty acids, a small amount of a solid, melting at 78°-80°C. and a new phenolic substance, styled *Jambulol*. This can be crystallised from pyridine, and forms brown needles containing solvent of crystallisation. It has the composition, $C_{16}H_{10}O_6$. The penta acetyl derivative forms pale-brown leaflets melting at

about 335°C., whilst the pentabenzoyl derivative is colourless, and melts at 333°C. No substance of a glucosidic nature was found in the seeds.—J. Ch. I. November 15, 1912, p. 1052.

The phenolic substance isolated from jambul seeds (this J. 1912, 1051) which was named "Jambulol," and which has also been detected in Chinese rhubarb (Chem. Soc. Trans. 1911, 99, 962 and Proc. 1912, 28, 96), and in *Euphorbia pilulifera* (this J. 1913, 505) has since been identified as ellagic acid $C_{14}H_2O_4$ (O H.) 4—A. S. J. Ch. I., August 30, 1913, p. 840.

506. *Barringtonia racemosa*, Blume, H.F.B.I.,
II. 507. *Roxb.* 445.

Vern :—Ijjal (H.); Samudra-phal (B.); Nivar (Concan); Samudra (Cuddapah); Samutra-pullam (Tam.); Samudra-pao, Sam-stravadi (Mal.)

Habitat :—On the sea coasts, Concan.

A moderate-sized evergreen tree, attaining 50ft., glabrous. Wood white, very soft, porous. It is a handsome tree, planted on the road sides in Colombo, for ornament. It is found on the west coast, from the Concan southwards near rivers and back waters, also inland. Leaves lightly crenate-denticulate, cuneate-oblong ovate or oblanceolate, 10 by 3in., narrowed into a very short petiole $\frac{1}{2}$ - $\frac{1}{4}$ in. long. Racemes 12-18in., pendulous; flowers cream-coloured, $2\frac{1}{2}$ in. across, distant. Pedicels $\frac{1}{2}$ - $\frac{1}{4}$ in. Calyx-tube $\frac{3}{4}$ in., ovate, closed in the bud, broadly funnel-shaped; segments 2-3, irregular. Filaments often crimson. Fruit ovoid, 2-2 $\frac{1}{2}$ in. long, obscurely quadrangular below when quite ripe; in ripening, attaining nearly its full length before one-third its full breadth. Exocarp very thick, fibrous.

Uses :—The root resembles Cinchona in medicinal virtues. It has de-obstruent and cooling properties. The fruit is efficacious in coughs, asthma and diarrhoea. The seeds are used in colic and ophthalmia (Watt).

The kernels of the drupes with milk, given in jaundice and other bilious diseases. The seeds are aromatic; used also in parturition (T. N. Mukerji).

The pulverised fruit is used as a snuff, and combined with other remedies, is applied externally in diseases of the skin (Treasury of Botany.)

507. *B. acutangula*, Gaertn. H.F.B.I., II. 508; Roxb. 440.

Habitat.—Very common, from the Himalaya throughout India; no tree is more plentiful in the plains of Bengal.

Vern. :—Hijgal, samundar-phal, panniri, ingar (H.); Hijal, samandar (B.); Kinjolo (Uriya); Hindol (Ass.); Ijar (Monghyr); Hinjal (Santal); Saprun (Kol.); Batta, kurpâ, kadamic (Tel.); Hole kanva (Kan.); Ingar, ijal, samundar-phal, kana-pachethi (Bomb.); Piwar, newar, tiwar, datte-phal (Mar.); Samudra phula (Cutch); Niwar (Concan); Sjeria-samstravadi (Mal.)

A middle-sized, evergreen, glabrous tree. Bark $\frac{1}{2}$ in. thick, dark-brown, rough. Wood white, shining, soft, even-grained. Leaves obovate or oblanceolate, minutely denticulate; blade 2-5 in. long, narrowed into petiole, $\frac{1}{2}$ – $\frac{1}{3}$ in. long. Flowers red, $\frac{1}{2}$ in. across, in long, slender, pendulous racemes 6-15 in. long. Calyx-segments rounded, ciliate. Ovary 2-celled. Fruit oblong, bluntly quadragular, 1 $\frac{1}{4}$ –1 $\frac{1}{2}$ in. long, crowned by the persistent calyx lobes.

Uses.—The root is bitter and supposed to be similar to Cinchona in its properties. It is also held to be cooling and aperient. The seeds are very warm and dry, used as an aromatic in colic and in parturition, also in ophthalmia (Watt). Considered by the natives of Bombay to be warm and stimulating and emetic, often prescribed alone or in combination with other medicines as an external application in colds. A few grains often given as an emetic to children suffering from catarrh, and seldom fail to induce vomiting (Dymock). The kernels powdered and prepared with sago and butter are said to be used in diarrhoea (Watt). The juice of the leaves is given in diarrhoea. The powdered seeds are used as snuff in headache (U. C. Dutt.) The fruit rubbed in water is administered as an emetic (Lisboa).

508. *Careya arborea*, Roxb., H.F.B.I., II. 511, Roxb., 447.

Sans.—Kumbhi.

Vern.—Kumbi, vâkamba, kumbh, (H. and Pb.); Kumbha, kumbhâsâla, kembya, vâkumbhâ (Mar.); Gummar (Gond.);

Boktok (Lepcha); Dambel (Garó.); Pailæpûta tammi (Tam.); Kumbir (Santal); Asunda (Kol.); Budâ-durmi, buda darini; dudippi (Tel.); Kaval (Kan.); Govuldu (Mysore).

Habitat.—Throughout India, from the Himalaya to Travancore and Tenasserim.

A large, deciduous tree, turning red in the cold season. Bark $\frac{1}{2}$ in. thick, dark-grey, with vertical and diagonal cracks, exfoliating in narrow flakes; linear substance reddish, fibrous. Wood moderately hard; sapwood whitish large; heartwood dull red, sometimes claret-coloured, very dark in old trees; even-grained (Gamble). Leaves membranous, obovate, narrowed into a short marginate petiole, crenate; secondary nerves prominent, 10-12 pair. Flowers 2-4 in. across, sessile, with an unpleasant smell, each supported by 3 unequal bracts; a few flowers clustered at the end of branchlets; petals white or greenish white, 1-2 in. long, filaments purple; ovules in 2 rows in each cell. Fruit green, globose, fleshy, 2-3 in. diam., crowned by the persistent calyx-segments and the remains of the long slender style.

Parts used.—The bark, flowers, juice and fruit.

Uses.—The bark is used as an astringent medicine by the natives. "The bark is applied to the wound in snake-bite and an infusion of the same is given internally" (Rev. A. Campbell, Mánbhum).

The flowers are given in Sindh as a tonic after child-birth (Murray.) In Bombay the natives use the flowers as well as the juice of fresh bark with honey as a demulcent in coughs and colds (Dymock).

The fruit is also astringent and used as a decoction to promote digestion (S. Arjun, 55). It is also pickled by Banyas of Gujrat.

"A miner who was at work in some gold fields in Australia, poisoned his hand, and a bad ulcer formed on the knuckle of one of his fingers. Ordinary treatment having proved useless, Dr. Armitt, F. L. S., tried, at the recommendation of a native, some leaves of the *Careya* made into a pulp and used as a poultice four times a day. In five days the ulcer had disappeared.

Having met with such success, Mr. Armitt subsequently tried it on similar occasions and always with similar results."—Chrysty's Commercial Plants and Drugs, No. 7, p. 44 (1884).

N. O. MELASTOMACEÆ.

509. *Memecylon edule*, Roxb. H.F.B.I., II. 563, Roxb. 325.

Vern.:—Limba (Mar.); Limba-toli (Kan.); Kashwa (Mal.); Alli chettu (Tel.); Kayampoovoocheddi, Casari-cheddy, Cashamarum (Tam.); Anjana, Yalki, Lokhande (Bomb.).

Habitat:—Eastern Peninsula and Ceylon; very common at Mahabaleshwar and on the Ghauts, less so in S. Concan.

A shrub or small handsome tree. Bark thin, light-brown, corky, narrowly-cleft ventrically. Wood light-brown, very hard, close-grained. Leaves $1\frac{1}{2}$ - $3\frac{1}{2}$ in., elliptic or ovate-acute at both ends, hard, acuminate. Secondary nerves more or less obscure; petiole $\frac{1}{8}$ - $\frac{1}{2}$ in. Cymes pedunculate, rarely axillary, generally above the scars of fallen leaves. Flowers brilliant blue, in a compact cyme, medium-sized. Calyx-tube at the time of flowering sauce-shaped; limb truncate; Calyx sometimes pink. Disk at the apex of the ovary depressed, obscurely-rayed. Berry $\frac{1}{4}$ in. diam., black-purple, globose, or slightly ovoid, mouth about $\frac{1}{4}$ in. wide.

Mr. C. B. Clarke mentions 12 varieties of this plant.

Mr. A. K. Nairne, in his "Flowering Plants of Western India" writes:—"From the mode of growth the flowers look almost as if they were parasitical on the tree. The colors blend in a lovely manner, and a poetical forest officer aptly described them to me 'as forming' globes of pink and blue and white, like living opals'."

Parts used:—The leaves and root.

Use:—The leaves are used as a cooling astringent; used in conjunctivitis as a lotion; and, given internally in leucorrhœa and gonorrhœa, they should be bruised in a mortar and infused in boiling water. Dr. Peters found them in use in Belgaum as a remedy for gonorrhœa of considerable reputation. In the Concan, the bark, with equal proportion of cocoanut kernel, ajwan seeds, yellow zedoary and black pepper, is powdered and

tied up in a cloth for fomentation or applied as a lep to bruises (Dymock). The root in decoction is considered very beneficial in excessive menstrual discharge (Drury).

N. O. LYTHRACEÆ.

510. *Ammania baccifera*, Linn. H.F.B.I., II. 569.

Syn.:—*A. vesicatoria*, Roxb. 143.

Vern.:—Dādmāri; Jangali mehndee (H.); Dader-bootie (Pb.); Kallar-vanchi (Mal.); Ban-marich; Aginbuti, Guren, Bhāra jambol (Bomb. and Dec.); Kallu rivi, Nirumel-neruppu (Tam.); Agni vendra paku (Tel.).

Habitat:—Very common throughout Tropical India.

Annual glabrous herbs, growing in damp places; erect, 6-8in., sometimes 2ft. Lower leaves and branches usually opposite; cauline leaves 1-2½in., usually narrow, but obtuse. Opposite or alternate, elliptic, narrowed at the base. Flowers in dense clusters forming knots on the stem or in loose, but very short axillary cymes. Calyx-tube hemispherical; teeth 4, broad, triangular, accessory folds or teeth small. Petals usually 0 or small. Capsule globose, depressed, imperfectly circumsciss above the middle. Seeds black, sub-hemispheric, excavated on the plane face (C. B. Clarke).

Use:—The leaves are exceedingly acrid; they are used universally by the natives to raise blisters in rheumatic pains, fevers, &c. The fresh leaves, bruised and applied to the part intended to be blistered, perform their office in the course of half-an-hour or a little more, and most effectually (Roxburgh). The leaves are applied to cure herpetic eruptions (Fleming).

In the Concan, the juice is given with water to animals when in heat, to extinguish sexual appetite. The plant, fresh or dried, is administered in decoction with ginger and *Cyperus* root for intermittent fevers, and its ashes are mixed with oil and applied to herpetic eruptions (Dymock).

"We made trials of this article in eight instances; blisters were not produced in less than 12 hours in any, and in three

individuals not for 24 hours. The bruised leaves had been removed from all after half-an-hour. The pain occasioned was absolutely agonizing until the blister rose. We should not be justified in recommending these leaves for further trial; they cause more pain than cantharides, and are far inferior to the *Plumbago* (lāl chitra) in celerity and certainty of action" (O'Shaughnessy).

On the other hand, Dr. Dymock says that he has made several experiments with an ethereal tincture of the leaves, which leads him to form a much more favourable opinion of them. In several instances it blistered rapidly, effectually and without causing more pain than the liquor epispasticus of the Pharmacopœia.

"In a recent correspondence with the Government of India, the Surgeon-General of Madras recommended that this plant should be excluded from the revised edition of the Pharmacopœia of India" (Watt).

The juice of the plant is given internally in spleen; but it causes great pain, and the result is not certain (T. N. Mukerji).

511. *A. senegalensis*, Lamk. H.B.F.I., II. 570.

Habitat:—Plains of the Punjab and of North-West Hindustan.

An annual, glabrous, erect herb, growing in damp places, 6-24 in. Branches sharply quadrangular, Cauline leaves 1-2 in., opposite, elongate-oblong, sessile, sub-auriculate at the base. Cymes peduncled, compound. Bracteoles on the cyme-branches, minute, linear. Calyx campanulate, with 4 or 8 green lines, becoming indistinct in fruit, teeth 4, broad-triangular. Petals 0, or caducous. Stamens 6 or 8, capsule $\frac{1}{2}$ in. diam., globose, becoming ultimately red, much exceeding the Calyx-tube. Seeds half-ellipsoid, excavated on the plane face.

Use:—Used as a blistering agent.

512. *Woodfordia floribunda*, Salisb. H.F.B.I., II. 572.

Syn.:—*Grislea tomentosa*, Roxb. 317.

Sans.:—Dhātaki.

Vern. :—Dhâi, Dhaula, Santha (H.); Dhaiphul (B.); Dhenti (Oudh); Dahiri (Nepal); Jatiko (Uriya); Dhâiti, Dhâmati, Dhâoshi (Bomb.); Serinji (Tel.); Phulsatti (Mar.); Dhavadina (Guz.).

Habitat :—Common throughout India.

A large shrub, with many long, spreading branches. Stem more or less fluted, often with 1 or 2 concentric bands of cortical tissue inside the wood. Bark smooth, peeling off in thin scales; young shoots and leaves with numerous black glands. Leaves opposite or sub-opposite, sometimes in whorls of 3, distichous, sessile, 2-4 by 1.3 in., lanceolate or ovate-lanceolate, usually acuminate, rounded or cordate at the base, entire, pale and generally grey pubescent beneath; lateral nerves 6-12 pairs, prominent beneath and joined by intramarginal veins. Flowers in short panicles, axillary cymes, rarely solitary. Calyx 4-6 in. long, tubular, bright-red, curved oblique at the mouth; teeth 6, short, with as many minute accessory lobes outside. Petals 6, white, acute, inserted in the sinuses of the Calyx-tube and scarcely exceeding the Calyx-teeth. Stamens 12, much exserted, declinate, inserted near the base of the Calyx; filaments red; anthers versatile. Ovary 2-celled, ovules many on axile placentas. (The stamens and styles are of varying lengths, the flowers thus becoming dimorphic or trimorphic.) Capsule ellipsoid, included in the persistent Calyx-tube; seeds many, brown, smooth. (Kanjilal).

Parts used :—The flowers and leaves.

Uses :—In Hindoo medicine the dried flowers are regarded as stimulant and astringent, and are much used in bowel complaints and hæmorrhages. Two drams of the dried flowers are given with curdled milk in dysentery, and with honey in menorrhagia. The powdered flowers are sprinkled over ulcers for diminishing their discharge and promoting granulation (U. C. Dutt).

"The dried flowers are astringent tonic in disorders of the mucous membranes, hæmorrhoids and in derangements of the liver, also considered a safe stimulant in pregnancy. The leaves are also officinal" (Mukerji).

"The natives of Concan, in bilious sickness, fill the patients' mouth with sesamum oil, and apply the juice of leaves to the crown of the head. This is said to cause the oil in his mouth to become yellow from absorption of bile; fresh oil is then given repeatedly until it ceases to turn yellow" (Dymock).

513. *Lawsonia alba*, Lamk. H.F.B.I., II. 573.

Syn.:—*L. inermis*, Roxb. 325.

Sans.:—Sakachere.

Vern.:—Hena, Mehndi (H.); Marutonri, Aivanam (Tam.); Goonutachettoo (Tel.); Mailanschi, Ponta-letsche (Malay); Iswan (Belgaum); (Mar.) Mendi; Hena (Bombay).

Habitat:—Very common throughout India.

A glabrous, erect shrub, with rounded branches, sometimes spinescent. Leaves opposite $\frac{3}{4}$ -1 $\frac{1}{2}$ in. long, elliptic, acute at both ends, on the tip obtuse, minutely petioled, entire, coriaceous. Flowers $\frac{1}{4}$ in. diam., sweet-scented, rose-coloured or white or greenish white, in large corymbosely-branched terminal panicles. Calyx-tube exceedingly short; lobes 4, $\frac{1}{10}$ in., ovate, permanent; petals 4, wrinkled. Stamens usually 8, inserted in pair between the petals. Ovary free, 4-celled, ovules many, style long. Capsule $\frac{1}{2}$ in. diam., globular like a pea, ultimately 1-celled, irregularly breaking up; seeds angular, on a central placenta. Flower and fruit throughout the year.

Uses:—Arabic and Persian works describe the leaves as a valuable external application in headache, combined with oil, so as to form a paste, to which resin is sometimes added. They are applied to the soles of the feet in small-pox, and are supposed to prevent the eyes being affected by the disease. They also have the reputation of promoting the healthy growth of the hair and nails. The bark is given in jaundice and enlargement of the spleen, also in calculous affections, and as an alterative in leprosy and obstinate skin diseases; in decoction it is applied to burns, scalds, etc. The seeds, with honey and tragacanth, are described as cephalic. An infusion of the flowers is said to cure headache, and to be a good application to bruises (Dymock).

A decoction of the leaves is used as an astringent gargle in relaxed sore throat. The fresh leaves are rubbed over the soles of the feet in the disease known as burning of the feet; sometimes a paste made with vinegar is used for the same purpose. *Henna* is used as an emollient poultice, and the flowers are considered refrigerant. The flowers are also used as a soporific, being for this purpose placed in a pillow. The oil and essence are rubbed over the body to keep the body cool (*Dr. Emerson*).

The Tamil physicians of Southern India make an extract from the flowering twigs and leaves much valued in the treatment of lepra (leprosy) and other depraved habits of the body (*Ainslie*). In the Concan, the leaf-juice mixed with water and sugar is given as a remedy for spermatorrhœa, and with milk in the condition known as "hot and cold fits" (*Dymock*).

"At Apollonia (a city in Greece), I caught a severe rheumatism in my feet. * * Amongst the many remedies which I applied *Lawsonia inermis* proved the most effective. Every evening before going to bed I applied to the affected part the pulverized herb, with as much water as was sufficient to make a soft poultice. In the morning I washed it off, but the place continued red; it is the same herb, indeed, with which the fair sex in the East stain their hands and feet (*Honnigberger*).

In that obscure affection termed "*Burning of the Feet*," often met with in India, they are esteemed by the natives one of their most valued *local applications*. *Dr. Grierson (Calcutta Med. Phys. Trans., vol. ii., p. 279)* mentions an obstinate case benefited by their use; and the Editor, when in Burmah, witnessed, in some cases, a great amount of temporary relief to the distressing sensation of burning from this remedy, when numerous other means had previously failed. The fresh leaves beaten up into a paste with vinegar, and applied as a poultice to the soles of the feet, was the common mode of application; but some patients obtained greater relief from using strong frictions with the bruised leaves over the part. Like all other remedies, however, they not unfrequently

fail to afford more than temporary relief. (See *Madras Quarterly Journ. of Med.*, vol. i. p. 300, 1860.) Cataplasms of the bruised leaves, or fomentations with an infusion of the leaves, are much employed as a local application to bruises, sprains and other diseases. An extract prepared from the leaves and flowers is given in leprosy (*Dr. J. Newton*). Pharmacopœia of India.

The seeds have been reported as oily, but an authentic sample from Saharanpur examined in 1907 contained only 10.5 per cent., extracted by ether. The iodine value of the oil was 121.6 and had the drying properties of poppy seed oil. [Hooper in the *Agricultural Ledger* 1911-12 No. 5 p. 147.]

514.—*Lagerstrœmia Flos-Reginae*, Retz., H.F.B.I.,
II. 577.

Vern.:—Arjuna, jarûl (Hind.); Jarûl (Beng.); Gara saikre (Kol.); Sekra (Santal); Ajhar, jarul (Assam); Bolashari (Garo.); Taman, bondara (Bomb.); Bondara, mota-bondara (Concan); Taman, tamana, mota bon, dara (Mar.); Kadali (Tam.); Chen-nangi (Tel.); Challâ, holedâsâl, maruva (Kan.); Adamboe (Malay.); yengma, kone-pyinna, pyinma (Burm.); Kamaung, (Magh.); Murute, mûrûta-gass (Sing.).

Habitat:—A large, deciduous tree of Eastern Bengal, Assam, Burma, and the West Coast, extending north to Ratnagiri; cultivated as far north as Lahore.

A large deciduous tree reaching 50-60ft., sometimes when old having on its trunk and larger branches a few strong straight spines, 1-3in. Bark smooth, grey to cream-coloured, peeling off in irregular flakes. Wood shining, light-red, hard. Leaves glabrous, 4-10in., from broad elliptic obtuse to long lanceolate. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long. Panicles large, lower branches often 6in., curved ascending flowers scattered. Flowers purplish lilac, 2-3in. across. Petiole distinct, usually $\frac{1}{4}$ in. Calyx thick, green covered with hard white (sometimes ferruginous) tomentum; ribs 12-14, flat or round, not acute on the back. Petals commonly 1in. (sometimes more), margins erose-undulate, hardly fimbriate. Calyx in fruit very much thickened, finally woody, lobes triangular, spreading, stamens of equal length. Apex of the ovary glabrous. Fruit a large capsule,

sometimes reaching $1\frac{1}{4}$ in. by lin.; the capsule is broadly ovoid, the lower third enclosed in the persistent Calyx. Seed with wing $\frac{1}{2}$ - $\frac{3}{4}$ in. long, pale brown.

Uses:—The root is prescribed as an astringent. "Its root, bark, leaves, and flowers are used medicinally by the Natives" (Beddome). The Rev. J. Long, in an article on the Indigenous Plants of Bengal, states that the seeds are narcotic, the bark and leaves purgative (Jour. Agri-Hort. Soc. of Ind. (Old Series), IX., 423). Dr. Thomson reports, that the fruit of the Pyenma is used in the Andamans as a local application for aphthæ of the mouth (Jour. Agri-Hort. Soc. of Ind. (Old Series), XI., 446).

"The bark, of this and of *L. indica*, Linn., is considered stimulant and febrifuge" (Surgeon-Major W. D. Stewart, Cuttack).

515. *Sonneratia acida*, Linn. H.F.B.I., II. 579, Roxb, 405.

Vern.:—Orcha, archaka (B.); Sundari guna (Uriya; Tivar (Bomb.))

Habitat:—Forests of the Sind-Coast. Rather common in Ceylon, in tidal Estuaries with the Man-groves. Also in the Dekkan Peninsula, in the Concan Littoral, forests of Bengal, Delta of the Indus, Sunderban, Burma, Siam, Java. Coast, from Chittagong to Tenassarim, ascending the rivers as far as the tides. Malay Peninsula and the Achipelago. Brandis makes the following noteworthy observations:— This and the other species of *Sonneratia* as well as a few other Man-grove trees send up, from their widely spreading horizontal roots, vertical branches, with soft pith-like wood which serve to facilitate the interchange of gas between the atmosphere and the roots buried in the mud of the tidal swamp.

A small tree, attaining 30ft. Root-branches frequent and continuous. Wood light, soft, even-grained (Gamble). Twigs quadrangular. Leaves nearly sessile, $2\frac{1}{4}$ -3 in., oblong-oval or roundish, tapering to base, obtuse, sometimes apiculate at apex, slightly fleshy. Flowers dark rose-red, large, 3 in. long, terminal, solitary, on very short thick pedicels, buds not ribbed, blunt, but apiculate at apex; Calyx-tube, quite without ribs,

segments 6, lanceolate, acute, longer than tube; petals 6, linear, about lin., rather longer than the Calyx-segments, persistent; stamens about 2in. erect; style considerably exceeding stamens. Fruit broadly ovoid or sub-globular, supported on enlarged calyx which forms a shallow cup, about $1\frac{3}{4}$ in. wide, rounded and slightly depressed on top, with the persistent tapering style-base, forming a point lin. long in the centre.

Uses:—The fruit is used as a poultice in sprains and swellings. The fermented juice of the fruit is said to be useful in arresting hæmorrhage.

516. *Punica granatum*, Linn. H.F.B.I. II. 581, Roxb, 402.

Sans.:—Dâdima.

Vern.:—Anar-ka-pêr, dhâlim, dhârimb. Flowers:—Gulnâr, julvar, dârim pushp. Fruit: anâr, daram, damu (H.); Dalimgachh. Flowers: gul-anâr, unnum. Fruit: anâr, dâlim, dârim, dârmi. Rind: anâr-kâ-chhilkâ. Seed: babul-kilkils (B.); Dâlim dâlimba (Uriya); Dâlim (Assam); Anâr-kâ-jar. Flower: gule-nâr. Fruit: anâr (Dec.); Madala, michi. Tree, etc. Fruit: anar, darim. Rind: nasput kushi-ala, post-anâr (U. P.). Tree, etc. Fruit: daru, daruni, dariun, danu, doan, jaman, daran, anar. Flowers: gul anâr, dârim, pashk. Rind: naspal, chal-anar. Seeds: anâr-dânâ (Pb). Tree, etc. Fruit: anor, anar, nargosh, ghar-nangoi (Pushtu). Tree etc. Fruit: anar, dhalim, dharimb, darhu. Bark: daru-jo-kul. Seeds: daru-bij. Rind: khashi'ala-chodi (S.); Ânâra, dâlimba (B.); Dalimba-jhada. Fruit: dalimba (Mar.). Dadamnu-jhada. Flowers: gal-anar. Fruit: daram, dadur, dadam (Guz.); Madalai, madalam, mugilan. Flowers: pumadalai. Fruit: madalaip-pazham (Tam.); Danimma, dadima, dalimba. Flowers: peurri-danimma. Fruit: dadima-pandu, dalimba-pandu, danimma-pandu (Tel.); Dalimbe-gida. Flowers: pushi-dulimbe. Fruit: dalimbe-kayi (Kan.)

Habitat:—Cultivated throughout India.

A large shrub or small tree. There are two varieties, one bearing a male flower consisting of a mass of scarlet petals which are abortive stamens, the filaments of which are a reversion

to petals ; with here and there an abortive anther or anthers ; the second is the variety which bears hermaphrodite flowers finally bearing fruit. Branchlets round, often spinescent. "Bark grey, thin, peeling off in small flakes. Wood light-yellow, with a small dark-coloured, irregular heartwood, hard, compact, and close-grained" (Gamble). Brandis says the tree is deciduous. Leaves opposite, often fascicled on arrested branches commonly 1-3in. long by $\frac{1}{2}$ - $\frac{3}{4}$ in. broad, narrower at both ends, oblong-lanceolate or oblanceolate, obtuse, narrowed into a slender petiole, intra-marginal nerve distinct or obscure. Hermaphrodite flowers shortly pedicelled, axillary, solitary or somewhat clustered large orange red. Calyx-tube funnel-shaped, coriaceous, adnate to the ovary below, enlarged above the ovary ; lobes 5-7 persistent on the fruit. Petals $\frac{1}{2}$ in., inserted in the mouth of the Calyx-tube crumpled in bud. Stamens numerous, inserted at different levels below the petals, anther-cells attached to the edges of a broad connective. Style long, bent. Stigma capitate. Carpels in several tiers on the inside of a hollow receptacle, here called Calyx-tube. Ovules numerous, placentas in some cells axile, in others parietal. Carpels coalesce early and form a large globose indehiscent fruit crowned by the persistent Calyx and containing under a coriaceous rind two tiers of cells, 3in. the lower, 5-9in., the upper, tier. Seeds numerous in each cell, and surrounded by red juice. Cotyledons foliaceous, spirally convolute.

"An anomalous genus allied to *Myrtaceæ* through *Psidium*, and to *Rosaceæ* through *Oydonia*." (Duthie).

Uses :—Hindoo physicians use the fresh juice of the fruits as an ingredient of cooling and refrigerant mixtures of some medicines for dyspepsia. They also use the rind of the fruit and the flowers, combined with aromatics, such as cloves, cinnamon, coriander, pepper, etc., as a bowel astringent in diarrhœa. The seeds are considered to be stomachic, the pulp cardiac and stomachic. No notice is to be found of the medicinal use of the pomegranate root-bark in Sanskrit works (U. C. Dutt).

The Arabs recommend the root-bark as being the most astringent part of the plant, and a perfect specific in cases of

tapeworm ; it is given, in decoction, prepared with two ounces of fresh bark, boiled in a pint-and-a-half of water till but three-quarters of a pint remain ; of this, when cold, a wine-glassful may be drunk every half-hour, till the whole is taken. This dose sometimes sickens the stomach a little, but seldom fails to destroy the worm, which is soon after passed (Dymock).

Pomegranate peel, combined with opium and an aromatic, such as cloves, is a most useful remedy in chronic dysentery as well as in diarrhœa. A decoction of the bark followed by a purgative, acts as an anthelmintic (Pharmacographia).

The root-bark and rind of the fruit are officinal in the Indian Pharmacopœia.

There are two chief alkaloids, *viz.*, *Pelletierine* and *Isopelletierine* present in the bark. These alkaloids are closely related, are liquids and volatile at ordinary temperatures and are present to the extent of 0.5— per cent. The bark also contains 25 per cent of tannic acid.

N. O. ONAGRACEÆ.

517. *Jussiaea suffruticosa*, Linn. H.F.B.I., II. 587.

Syn. :—*J. exaltata*, Roxb. 371.

Vern. :—*Lal-bunlanga* (B.) ; *Neeroo-agheen-drapakao* (Tel.) ; *Carambu* (Mal.) ; *Pânalavanga* (Bomb.) ; *Petra da, dak ichak* (Santal). *Pârsâti* (Chutia Nagpur).

Habitat :—Throughout the greater part of India, except the Western desert region.

A semi-shrubby perennial, erect, 2-4ft., sometimes 4-6ft., much branching, woody below. Branches stiff, erect, cylindric, striate, thickly clothed with short spreading hair. Leaves 2-4 by $\frac{3}{4}$ in., nearly sessile, varying from linear to broadly oval, but usually lanceolate, entire, tapering to base, acute, hairy on both sides. Lateral veins numerous, prominent beneath. Flowers bright chrome-yellow, $1\frac{1}{2}$ - $1\frac{3}{4}$ in. pedicels, shorter than Calyx-tube, with two lanceolate bracts at summit. Calyx hairy ; tube quadrangular ; segments four, ovate, alternate, acute, larger than the tube. Petals $4\frac{1}{4}$ - $\frac{3}{4}$ in., wholly yellow, rotundate, shortly-clawed, often emarginate, ninnately veined. Stamens

8, erect. Filaments very short; style very short; stigma large, quadrate-pyramidal. Capsule about 1 in., quadrangular truncate, tapering down-wards, hairy, 8-ribbed, thin. Seeds minuate, ovoid, brown, polished. Raphe prominent.

Uses:—The plant reduced to a pulp and steeped in butter-milk, is considered useful in dysentery; a decoction is used as a vermifuge and purgative (Ainslie).

In Jaspur, the root is boiled and the liquid is drunk for fever (J. J. Wood's Plants of Chutta Nagpur, p. 105).

518. *Trapa bispinosa*, Roxb: H.F.B.I., II. 590, Roxb, 144.

Sans.:—Sringataka.

Vern.:—Singhára (H.); Paniphal (B.); Párigadda (Tel.); Karim pola (Mal.); Shingoda, Singodi (Guz.); Shingádā (Mar.); Shingári (Dec.); Shingará (Tam.)

Habitat:—Throughout India.

A floating herb much cultivated in fresh water tanks or ponds for its delicious fruit. The roots are typically hairy, long, fine and trailing. In the Roxburghian type, says C. B. Clarke, floating leaves 2 by 2½-3 in., very villous beneath, posterior margin entire, anterior lightly crenate; petiole 4-6 in., woolly. Fruit 1-1½ in. long and broad, glabrous or hairy but slightly; two opposite angles, each with an often retrorsely scabrous spine, the other two angles obsolete.

Use:—The nuts are farinacious, and used as food; considered by natives cool and sweet, useful in bilious affections and diarrhoea. The nuts are also used in the form of poultices (Punjab Products). See K. R. Kirtikar's paper in Vol. I (Bombay N. H. Society).

N. O. SAMYDACEÆ.

519. *Casearia graveolens*, Dalz, H.F.B.I., II. 592.

Vern.:—Naro, nahraw, chila, pimpri (Bomb); Chilli, nara or narha (Dehra Dun); Naro (Bijnor).

Habitat:—Garhwal and Kumaon; Sikkim; Deccan Peninsula, especially the Western side, common; Burma.

A shrub or tree, 20ft. high; glabrous. Leaves 4-8 by 1-2in., broad elliptic, little acuminate, rounded or acute at the base; petiole $\frac{1}{4}$ in. Flowers numerous, green, with a disagreeable odour, clustered in the axils of the leaves. Pedicels short, about $\frac{1}{4}$ in., jointed above the base, pubescent below the articulation. Calyx lobes 5, sometimes pubescent. Petals none. Stamens 8, alternating with scale-like staminodes. Fruit $\frac{3}{4}$ in., oblong-ellipsoid, 3-valved, glabrous, shining, 12 seeded.

This species is distinguished from *C. esculenta* by its less entire, less thick, leaves, and the Calyx pubescent at its base.

Use:—The fruit is used for poisoning fish (Duthie).

520. *C. esculenta*, Roxb : H.F.B.I., II. 592. ROXB., 377.

Vern.:—Kunda-jungura (Tel.); Kodnapragara (Tel.); Jirukaneli (Mal.); Mori, bokra (Bomb.).

Habitat:—Western coast from the Concan southwards, and Hills of the Western Ghats. Common in the moist and dry regions and heights of Ceylon.

A shrub or tree, with slender branchlets, bark yellowish-white, smooth. Young parts glabrous. Wood moderately hard, evengrained. Leaves 2-5in., from narrow lanceolate to oval, tapering to base, shortly acuminate obtuse or sub-acute, entire or faintly serrate in upper part, perfectly glabrous, rather thick, petiole short, stipules persistent. Petals greenish, stout, longer than Calyx and articulated at base, which is surrounded by numerous very small bracts, few or many, on a raised boss, in axils of past and present leaves. Calyx-segments ovate, obtuse, persistent; stamens 6 or usually 8; staminodes as long as filaments, oblong, ciliate or hairy. Fruit broadly ovoid or ellipsoid, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, apiculate, glabrous or very slightly pubescent, edible, orange-yellow, dehiscing by 3 (or 2), thick valves. Seeds several, almost entirely covered by the fleshy lacerate scarlet aril (Trimen).

Use:—The roots are purgative, and as such used by the hill people (Roxb).

521. *C. tomentosa*, Roxb : H.F.B.I., II. 593, ROXB, 377.

Syn. :—*C. elliptica*, Willd.

Vern. :—Chilla, chilara, bairi, bhari (H.) ; Maun (Manbhum) ; Roré (Kol.) ; Chorcho (Santal.) ; Munkuru-kuri (Mal.) ; Girari (Uriya) ; Thundri (Gond.) ; Khesa (Kurku.) ; Men, wasa, gam-gudu (Tel.) ; Lainja, massei, karei (Mar.).

Habitat :—Common throughout India.

A small deciduous tree, attaining 25ft. Bark $\frac{1}{8}$ in. thick, brittle, exfoliating in more or less square flakes. Wood yellowish-white, moderately hard, rough, close-grained (Gamble). Branches spreading, all parts bitter. Branchlets tomentose or nearly glabrous. Stipules small, soon falling off. Leave obscurely serrate, elliptic-oblong, narrowed towards the apex or lanceolate, sometimes entire, not acuminate, base acute or rounded, 3-7 by $1\frac{1}{2}$ -3 in., tomentose beneath ; midrib and petiole, when full grown, hairy ; petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long, translucent glands round or broad, elliptic. Flowers small, tomentose, $\frac{1}{2}$ in. long, densely clustered on scanty axillary tubercles, bisexual, regular, green-yellow, shortly stalked. Calyx free, persistent, tomentose, 5-parted, lobes orbicular, concave. Petals 0. Stamens 8, alternating with short ciliate staminodes ; "Stamens 7-10 (sometimes 12, Benth.)," says C. B. Clarke ; filaments free, anthers 2-celled. Ovary superior, 1-celled ; style very short, stigma capitate ; ovules numerous. Capsule more or less succulent, ovoid, $\frac{3}{4}$ in. long, 6-ribbed, opening by valves ; seeds about 8 in each, valve ovoid, enveloped in a fleshy red aril.

Use :—The fruit is used to poison fish (Stewart). The bark is bitter and used as an adulterant for Mallotus Phillipinensis (kamela) powder. The bark is applied externally in dropsy (Rev. Campbell, Santal.).

The leaves are used in medicated baths, and the pulp of the fruit is a very useful diuretic (Lindley).

N. O. PASSIFLORÆ.

522. *Carica Papaya*, Linn: H.F.B.I., II. 599.
ROXB. 736.

Eng:—The Papaw or Papaya Tree.

Vern:—Pappiyá, pepiyá (B.); Papaya, papiya-amba, popaiyah (H.); Arand-kharbúza, kharbúz (Pb.); Popái (Duk.); Papai, papaya (Mar., Cutch and Bomb.); Paputa, katha chibhaddo (Sind); Papiá, papáyi, kath, chibda, eranda kakdi (Guz.); Pappáyi, pappáli (Tam.); Bappáyi or boppáyi, madana-anapakáya (Tel.); Perangi, perinji (Kan.); Pappáya (Mal.).

Habitat:—Cultivated in gardens throughout India.

Introduced from South America. A small, fast-growing tree, usually unbranched, with milky juice. Bark thin, fleshy within, papery outside. Wood soft, consisting of an outer ring of fibrous wood bundles surrounding a large central mass of cellular pith tissue. In the wood ring the bundles are wedge-shaped, crossed ladder-like at intervals by bars in which the rather small pores are found. Between the bundles comes the rather indistinct soft medullary rays on the vertical outer surface of the wood circle; the ends of the bundles form a diamond-shaped network (Gamble). Leaves glabrous, palmatifid-12-24 in. across, on long hollow petioles, forming a round tuft at the top of the stem. Stipules 0. Male flowers pale-yellow, fragrant, in long, drooping axillary panicles, generally dioecious, but occasionally there are a few hermaphrodite flowers on a male plant. Female flowers in short clusters. Calyx small, 5-lobed. Corolla-male:—tubular, 5-lobed; Female:—of 5 tincar deciduous petals. Stamens 10, inserted in two rows in the mouth of the Corolla. Ovary free, ovules numerous, attached to 5-parietal Placentas. Fruit indehiscent, fleshy, sulcate. Seeds black, numerous, embedded in sweet pulp, the testa consisting of an inner hard, and an outer soft, larger. Embryo straight; cotyledons flat, in oily albumen.

Uses:—Used in cases of enlarged spleen. The juice esteemed good for ringworm and also vermifuge (Lindley). The seeds are also considered vermifuge (O'Shaughnessy).

The anthelmintic properties of the milky juice of the unripe fruit were first noticed in the 17th century by Hernandez ; and the attention of the profession in India was called to it in 1810, by Dr. Fleming (*Asiatic Researches*, vol. xi.) who cites an interesting passage from the writings of M. Charpentier Cossigni in support of its alleged virtues. Further confirmatory evidence has more recently been adduced by M. Bouton (*Med. Plants of Mauritius*, 1857, p. 65), and it may justly be concluded that the statements as to its efficacy as an anthelmintic are founded on fact. The following mode of administration, employed by the late Dr. Lemarchand, of the Mauritius (cited by Bouton), it would be desirable to adopt in all future trials with this remedy : Take of fresh Papaw milk and honey, of each a tablespoonful ; mix thoroughly, gradually add three or four tablespoonfuls of boiling water : and when sufficiently cool take the whole at a draught, following its administration two hours subsequently by a dose of castor oil, to which a portion of lime juice or vinegar may be added. This may be repeated two days successively if required. The above is a dose for an adult ; half the quantity may be given to children between 7 and 10 years of age ; and a third, or a teaspoonful, to children under three years. If it cause griping, as it occasionally does, enemas containing sugar have been found effectual in relieving it. Taking the dose abovenamed as correct, the statement of Sir W. O'Shaughnessy (*Bengal Disp.* p. 352), that he had administered the milky juice as an anthelmintic, in doses of from 20 to 60 drops, without obvious effect, is fully explained. It is principally effectual in the expulsion of lumbrici. On tænia it is reported to have little effect. Anthelmintic virtues have also been assigned to the seeds, which have a pungent taste, not unlike that of mustard and cress, but the evidence of their efficacy is very inconclusive. A belief in their powerfully emmenagogue properties prevails amongst all classes of women in Southern India ; so much so, that they assert that, if a pregnant woman partake of them, even in moderate quantities, abortion will be the probable result. This popular belief is noticed in many of the reports received from India. In them it

is also stated that the milky juice of the plant is applied locally to the os uteri, with the view of inducing abortion. Facts in support of the alleged emmenagogue properties of the papaw are still wanting. It is not within the scope of this work to consider the alleged power of the juice of the papaw to lessen the cohesion of the muscular fibre, or, in homely language, to render tough meat tender. The subject, which is discussed *in extenso* by Sir W. J. Hooker (*Bot. Mag.* Nos. 2998 and 2999), Dr. Wight (*Illustr.*, vol. ii., p. 34, *et seq.*), and Dr. John Davy (*Edin. Med. Phil. Mag.*, Oct., 1855) must still be regarded as *sub-judice*. (Ph. Ind.).

Papaw leaves contain an alkaloid *Carpaine*, which has been used as a heart tonic and febrifuge.

From Papaw juice is extracted Papain, which is a white, or whitish, amorphous powder, possessing a solvent action on animal proteids. A five per cent. solution of Papain is stated to dissolve false membrane in diphtheria, and to be a good application to warty epitheliomatous growths.

Injections of $\frac{1}{2}$ -2 grains and upwards have been successfully used in scirrus and other malignant tumours (*B. M. J.* 1906, Vol. I., p. 1439 *et seq.*, also 1907, Vol. I. p. 135).

The leaves contain an alkaloid *Carpaine*,* which crystallises in anhydrous, colourless, lustrous prisms melting at 121°, and resolidifies at about 90°; on further heating, it undergoes partial decomposition, some subliming in colourless needles. The alkaloid is extremely soluble in chloroform and carbon bisulphide, more sparingly in light petroleum and alcohol, and insoluble in water; in alcoholic solution it is dextrorotatory, $[\alpha]_D = +21.55^\circ$. The base does not give a colour reaction with sulphuric acid either alone or in presence of bromine water or vanadic anhydride; with potassium chromate and sulphuric acid, a green coloration is produced, nitric acid gives no reaction. The formula of the alkaloid, is $C_{14}H_{25}NO_2$.

Carpaine does not react with benzoic chloride or acetic chloride, but, on treatment with acetic anhydride, a compound is formed which has not yet been investigated. Ammonia and an acid free from nitrogen are formed by the oxidation of carpaine with sulphuric acid and potassium permanganate. —*J. Ch. S.* LXIV. at I. 1893, pp. 740-741.

On methylation, carpaine yields *methylcarpaine*, crystallising from dilute alcohol in small colourless prisms, melting at 71°, benzylation of nitrosocar-

* The alkaloid is contained in leaf epidermis and to a lesser extent in the underlying parenchyma, epidermis of leaf stalk.

paine yields a colourless crystalline substance melting at 100° , and containing the nitroso-group unchanged; the alkaloid on oxidation with potassium permanganate in acid solution, gives rise to a variety of compounds which are still under investigation.—J. Ch. S. LXXII pt. I. (1897), p. 647.

Since methylcarpaine, $C_{14}H_{24}MeNO_2$, reacts with benzoic chloride, it probably contains a hydroxyl group. A glucoside, *carposide*, has been obtained from the leaves; this crystallises in colourless needles, and is insoluble in ether, but soluble in alcohol, and in water. Its aqueous solution reduces Fehling's solution only after boiling with dilute sulphuric acid.—J. Ch. S. LXXIV., pt. I. (1898), p. 283.

Pure dried juice should give no reaction for starch with iodine, nor reduce Fehling's solution before or after hydrolysis.

"A question of importance to be settled is the most serviceable form of commercial *papain*. And since prolonged moisture is deleterious, the juice should be dried as soon as possible; but heat is said to destroy its activity, hence it should be dried at a low temperature. A preparation of this kind is sold in commerce under the name of 'Finkler's Papain.' The best method to prepare *papain* is to collect the juice of the unripe fruit, mix it with twice its own volume of rectified spirit, let the mixture stand for a few hours, and then filter off the insoluble matter and dry *in vacuo* or over calcium chloride at the ordinary temperature of the atmosphere. After being powdered it should be kept in well-stoppered bottles ready for use. In view of a possible trade either in India or in Europe, manufacturers are recommended to observe carefully the precautions just enumerated. On account of caste difficulties, it might not prove possible to introduce animal pepsin very largely into use in India, but a good vegetable substitute might be of much value and find a ready sale." (Watt's Commercial Products of India.)

523. *Modecca Palmata* Lam. H.F.B.I., II. 603.

Vern. :—Undal (Concan).

Habitat.—Western Peninsula.

A large perennial herb, becoming woody at base; stems long, thickened at nodes, cylindric, smooth, and shining, mottled with purple and covered with a bloom, slightly branched. Leaves large, 4-5 in., broader than long, usually very deeply palmately 5-lobed (rarely 3-lobed or undivided), very glabrous and shining, especially beneath, lobes oval, narrowed at base, shortly acuminate, acute, entire, veins conspicuous, vinous-red, prominent beneath, where are often dots of red colour, and between the bases of main veins 4 circular, flat, pellucid glands as well as 2 large ones on the outer side of the lateral veins;

petiole about 2in., stout, curved with 2 short, setaceous stipules at base. Flowers rather large on short articulated pedicels in two opposite cymes of three, on a long axillary peduncle which is continued beyond them as a long simple tendril. Calyx $\frac{5}{8}$ in., truncate at fleshy base, broadly and squarely campanulate, glabrous, segments triangular, acute, slightly spreading; petals small, distant, linear, inserted at base of Calyx-tube, rather larger in male flower, more or less hairy; disk wide, with 5 circular pits opposite segments with white cilia (Corona) on their outside, and a short blunt, erect process within each. Male flowers:—stamens distinct, filaments very short, anthers linear, ovary rudimentary. Female flowers:—staminodes 5, erect, immediately surrounding ovary, small, acute. Ovary shortly stalked, globose, smooth, tapering into 3 long styles; stigmas much divided; feathery. Fruit nearly 2in. on a stout stalk, globose, apiculate, smooth, orange, splitting into 3 fleshy valves. Seeds on long stalks, nearly $\frac{1}{2}$ in., mariculate and pitted, black, each enclosed in large pulpy aril.

Flowers greenish-white, tinged with pink.

Use:—The root is said to be poisonous, and is used by the Singhalese as a medicine (Thwaites).

N. O. CUCURBITACEÆ.

524. *Trichosanthes palmata*, Roxb., H.F.B.I., II. 606; Roxb. 695.

Sans.:—Mahākāla.

Vern.:—Lāl-indráyan (H.); Mākāl (B.); Kaundal (Bomb.); Koratti, Shavari-pazham (Tam.); Avvagûda-pandu (Tel.); Avagude-hannu (Kan.).

Habitat:—Throughout the Eastern Tropics, from the Himalaya to Ceylon and Singapore.

Perennial herbs; stems long, woody below, wide climbing, often 30ft., angular or irregularly rounded, slightly scabrous, sometimes twisting spirally to a marked degree. Dioecious.

Stems often as thick as a man's arm, marked with parallel rows of irregular, small warts on either side of each fissure, noduled and pointed, each joint $\frac{1}{2}$ 1-2 or 3 in. distant; giving off leaves on branches at joints only. Outer bark light-grey or brown, warts corky, peeling off easily in regular bits, often presenting the appearance of crocodile stem. Mesophloëm deep green. Tendrils 3, or 2-fid, minutely spiral. Leaves 4-8 in. long, 2-6 in. broad, 3-5 or even 7-lobed, palmate, membranous, bright green; lobes acute, more or less dentate-serrate, glabrous, often scabrous with 1 or 2 small glandular discs above and on the nerves beneath; base cordate; nerves 3-5, petiole 1-2 in. long, winding or twisted, channelled, with several glands at apex, scabrous. Stipules single, small, axillary. Flowers white; delicate, in the female, stout white in the male. Male flowers:—Racemes, drooping 6-9 in., axillary longer than the leaves, solitary, few-flowered. Peduncles sometimes paired, stout, 5-6 in. long. Flowers over 2 in. nearly sessile, distant, each in the axil of a very large broadly wedge-shaped, glabrous or pubescent, lacerate persistent bract 1 in. or more long, often set with broad flat glands. Calyx-segments ovate, tomentose, deeply toothed or serrated, leafy, 1-1½ in., bractlike petiole, rather longer than the Calyx-segments, 1 in., wedge shaped, with many and long filiform laciniae. Corolla 4 in. diam., hypercrateriform, having the appearance of a parasol, with its fimbriae hanging down in beautiful tapers. Petals marked yellow at base, cuneate. Filaments triadelphous. Anthers syngenseious, very anfractuous. Female flowers solitary, smaller and more delicately fimbriated than the male, axillary; peduncle not so stout as in the male. Calyx-teeth of the female flower less marked. Calyx-tube short. Petals, according to some, nearly destitute of fimbriae. Corolla altogether much smaller than that of the male. Fruit 2-4 in. diam., globose, smooth, of the size of an ordinary orange, with a blunt nipple, brilliant scarlet, crimson; pericarp thick; pulp greenish, seeds numerous, densely packed, each seed about $\frac{1}{2}$ – $\frac{1}{4}$ in. long, oblong, compressed, smooth, brownish-grey, obtuse-margined, containing a sweet oily kernel.

Parts used :—The fruit and root.

Uses :—The fruit pounded and well mixed with warm coconut oil, forms a valuable application to sores under the ears and nostrils (Ainslie.)

The fruit is reckoned poisonous and, I am told, it is mixed with rice and employed to destroy crows (Roxburgh).

The root is used as a cattle medicine in inflammation of the lungs (Wight).

In Bombay, the fruit is smoked as a remedy for Asthma. The root, with an equal portion of Colocynth root, is rubbed into a paste and applied to carbuncles; combined with equal portions of the three myrobalans and turmeric, it affords an infusion which is flavored with honey and given in gonorrhœa (Dymock).

The juice of the fruit or the root-barks, boiled with gingelly oil, is used with good effect as a bath oil, for the relief of long-standing or recurrent attacks of headache (Surgeon-Major Thompson in Watt's Dictionary).

525. *T. cordata*, Roxb, H.F.B.I., II. 608 : Roxb, 695.

Vern. :—Bhoë-koomra ; Bhûmi-kûmara ; Bhâ-khûmba ; Patol (B.).

Habitat :—From the base of the Eastern Himalaya in Sikkim and Assam to Pegu. Frequent in the Khasia Terai and Cachar.

An extensive climber, with large tuberous roots and stout branching stems; tendrills usually very stout, 3-fid. Leaves 6-8 in., entire or obscurely angular, broadly ovate-cordate, acute or shortly acuminate, dentate-serrate, dark-green above, and with short scattered hairs on both surfaces; petiole 2-4 in., stout. Male racemes few-flowered; bracts large, elongate, sheathing at the base, obovate, entire, pubescent. Calyx-tube 1½ in., lobes acuminate, denticulate. Fruit as in *T. palmata*. (Duthie).

Parts used :—The root and flowers.

Use :—The large tuberous roots are used as a valuable tonic and as a substitute for Calumba (Roxburgh). In Patna, the

dried flowers are believed to be stimulant, in doses of 2 to 5 grains (Irvine). In Dacca, the root, dried and reduced to powder, is given in doses of 10 grains in enlargements of the spleen, liver and abdominal viscera. The fresh root, mixed with oil, forms a common application for leprous ulcers (Taylor's Topography of Dacca).

526. *T. dioica*, Roxb. H.F.B.I., II. 609; Roxb. 694.

Sans. :—Patola.

Vern. :—Parvar, palval (H.); Patol (B.); Kombupudalai (Tam.); Kommu-potla (Tel.); Patolam (Mal).

Habitat :—Common throughout the plain of North India, from the Punjab to Assam and East Bengal.

An annual; stems twining extensively, more or less woolly and scabrous. Dioecious. Leaves 3 by 2 in., cordate, oblong acute, harsh sinuate-dentate, not lobed. Petiole scabrous, woolly, $\frac{3}{4}$ in.; tendrils 2-fid. Male peduncles paired, the second-flowering, often 2 in.; male flowers not racemed, woolly without; anthers free. Calyx-tube $1\frac{1}{4}$ in., narrow. Fruit 2-3 $\frac{1}{2}$ in., oblong or nearly spherical, acute, orange-red. Seeds $\frac{3}{8}$ - $\frac{1}{2}$ in., half ellipsoid, compressed, corrugate on the margin. Roxburgh says stamens three, distinct, which has been repeatedly verified in the living plant (C. B. Clarke).

Use :—In Hindoo medicine, the leaves are described as a good, light and agreeable bitter tonic. The fresh juice of the unripe fruit is often used as a cooling and laxative adjunct to some alterative medicines. In bilious fever, a decoction of *patola* leaves and coriander in equal parts, is given as a febrifuge and laxative (Dutt).

An alcoholic extract of the unripe fruit is said to be a powerful and safe cathartic. According to Dr. K. L. Dey, "the bulbous part of the root is a hydragogue cathartic. The root of this plant acts like elaterium, for which it can be substituted." The old Hindoo physicians placed much confidence in it in the treatment of leprosy. Dr. Bowser, from personal trials, describes it as a febrifuge and tonic. (Ph. Ind.).

527. *T. nervifolia*, Linn. H.F.B.I., II. 609.

Vern. :—Parvar ; Palval (H).

Habitat :—Dekkan Peninsula, Western India, Quilon, and Coorg, Tropical region, Ceylon.

A large perennial, herbaceous climber. Stems somewhat woody below, flexible, thickened at nodes, much-branched. Branches slender, striate, glabrous, tendrils bifid. Leaves $2\frac{1}{2}$ -3 $\frac{1}{2}$ in., ovate-lanceolate, cordate or rarely lobed at base, very acute, mucronate, distantly denticulate, glabrous, dark-green, paler beneath, with prominent reticulate venation. Petiole $\frac{1}{2}$ -lin. Flowers white ; male flowers on short pedicels, 4-12 in. pedunculate corymbose racemes ; bract small, caducous. Calyx-tube $\frac{3}{4}$ -1 $\frac{1}{4}$ in., very narrow, inflated above ; segments minute, setaceous. Petals oblong, acuminate, with fimbriæ much branched and very long at the end of petals, but shorter on the sides, doubled inwards in the bud. Female flowers shortly stalked, solitary. Calyx-tube nearly 2 in., very much produced above ovary ; segments longer than in male flower. Fruit 1 $\frac{1}{2}$ in., ovoid, shortly beaked, smooth, scarlet, pericarp thin ; seeds few, with very long stalks, ovoid, compressed, thickened at margins, each enclosed in an envelope of scarlet pulp (Trimen).

Use :—Medicinal properties similar to *T. dioica*, Roxb.

528. *T. cucumerina*, Linn. H.F.B.I., II. 609 ; ROXB. 694.

Habitat :—Throughout India.

Sans. :—Patol.

Vern. :—Jangli-chichonda (H.) ; Ban-chichinga, ban-patol (B.) ; Jangli-padavala, Kadupadavala, pudoli, Ran-parval (Bomb.) ; Plpoodel, Poodel, Kat-tup-pepudal, kadu-parval (Tam.) ; Adavi-potla, Chaynd-potla (Tel.) ; Kaippam-patolam, Podavalam, Pactavalam (Mal.).

Stem twining, more or less pubescent. Leaves cordate, subreniform, 2-4 in. diam., pubescent or puberulous on both surfaces, usually 5 lobed about half way down, lobes obtuse or if acute not acuminate ; petiole $\frac{3}{4}$ in. ; tendrils 2-fid. Male peduncles in pairs, the earlier 1-flowered, the later racemose ;

occasionally in place of the earlier is found a female. Calyx-tube 1in. Fruit 1-3in. ovoid conical. Seeds $\frac{3}{8}$ - $\frac{1}{2}$ in., corrugate, half-ellipsoid, compressed, in red pulp. (C. B. Clarke).

Uses :—Mahomedan writers describe the plant as cardiacal, tonic, alterative and antifebrile, and say that it is an useful medicine for boils and intestinal worms. The author of the Makhzan remarks that the Hindoos in obstinate cases of fever, infuse 180 grains of the plant with an equal quantity of the coriander, for a night, and in the morning add honey to it and strain the liquor. This quantity makes 2 doses, one of which is taken in the morning and one at night. In Bombay, the plant has a reputation as a febrifuge; it is given in decoction with ginger, chiretta and honey. In the Concan, the leaf juice is rubbed over the liver or even the whole body in remittent fevers (Dymock).

The seeds are reputed good in disorder of the stomach on the Malabar Coast. The unripe fruit is very bitter; the tender shoots and dried capsules are bitter and aperient; they are given in infusion. In decoction with sugar, they are given to assist digestion. The seeds are antifebrile and anthelmintic. The juice of the leaves expressed is emetic and that of the root, drunk in the quantity of 2oz. for a dose, is very purgative. The stalk in decoction is expectorant (Drury).

529. *T. anguina*, Linn., H.F.B.I., II. 610; Roxb. 69.

Sans. :—Chichinda.

Vern. :—Cháchendá (H.); Chichingá (B.); Parula, Padavala (Bomb.); Linga potla, Potla, Potla káya (Tel.); Padavala káyí (Kan.); Gálartori; Pandol; Chichinda (Pb.).

Habitat :—Cultivated throughout India.

An annual climber, much cultivated for its fruit, which is used as a wholesome vegetable. Leaves cordate-sub-reniform, more or less 5-(3-7)-lobed, 5-angular lobes, not acuminate, pubescent or puberulous on both surfaces. Tendrils 3-fid. Male flowers in a large peduncled raceme, with a small entire bract at the base of pedicel; female solitary, on a short peduncle, from the same axils with the male. Fruit elongate cylindric,

sometimes contorted, 1-3 at times, 4ft. long by 1-1½ in. broad. Seeds corrugate, numerous.

"Except in the fruit this agrees altogether with *T. cucumerina*, of which it is probably a cultivated form" (C. B. Clarke).

Use:—The seeds are considered a cooling medicine (T. N. Mukerji).

530. *Lagenaria vulgaris*, *Seringe*, H.F.B.I., II. 613.

Syn.:—*Cucurbita lagenaria*, Linn. Roxb. 700.

Sans.:—Alabu; Katutumbi (bitter variety).

Vern.:—Kaddu, Lauki (H.); Harrea Kaddu (Dec). Láu (B.); Shora-kai (Tam.); Bella-sehora (Mal.); Sora-kaya; Anapa-kai (Tel.); Hunea-kuddoo (Dec.).

The bitter variety known as:—Karwi-tumbi (H.); Tikta-láu (B.); Kadwa-bhopla (Bomb.); Kadu-bhopali; Dudha-bhopala (Mar.).

Habitat:—Cultivated throughout India.

A large, pubescent, climbing annual. Tendrils 2-fid.—Leaves often 6in. diam., softly pubescent on both surfaces, more or less 5-angular or 5-lobed, ovate or orbicular, cordate, dentate. Petioles long, with 2 glands at its apex. Flowers large, white, solitary, monœcious or diœcious. Male peduncle often 6in. Female peduncle 1in. Calyx-tube funnel-shaped, sub campanulate, teeth 5, narrow, ½ in., pubescent. Petals 1-2in., 5, ovate; stamens 3, anthers connate, included, one 1-celled, two 2-celled, cells conduplicate, rudiment of ovary 0. Female Calyx and Corolla as in the male. Ovary oblong, style short, with 3 bifid stigmatic lobes. Ovules many, horizontal. Fruit often 1½ ft. or more, usually bottle or dumb-bell shaped, thick membranous, almost woody when old, indehiscent. Seeds ¾ by ⅔ and ⅓ in., with an impressed groove parallel to and near the margin.

Uses:—The seeds of this plant yield an oil which is used as an application for headache. The flesh of the fruit is considered diuretic, refrigerant and antibilious. It is also sometimes made into a poultice; when fresh, it is bitter and purgative,

and is applied over the shaved head in delirium (Watt). In the Punjab, the pulp is applied to the soles, in "burning of the feet."

The pulp of the bitter variety is powerfully emetic and purgative. In Bombay it is used in native practice as a purgative; it is also applied externally as a poultice. (Dymock.) A decoction of the leaves mixed with sugar is given in jaundice (Drury).

531. *Luffa ægyptica*, Mill., H.F.B.I., II. 614.

Syn.:—*L. pentandra*, Roxb. 698.

Vern.:—Ghiā-turai, purul (H.); Dhundhul (B.); Nunibeerd (Tel.); Bhol, bhatkerela, bhat-kakrel (Ass.); Palo (Nepal.); Turi, lia-sada (Sind.); Dilpasand, teldoaka (C. P.); Ghosāli, parosā, parul, turi-gonsāli (Bomb.); Turia (Guz.).

Habitat:—Very common throughout India; often cultivated.

Extensively climbing, hairy, annual herbs; tendrils 2-3-fid. Largely cultivated for its fruit, abundant in the rainy season in the Concan. Leaves 4in. diam., reniform-orbicular, 5-angled or somewhat 5-lobed, dentate, usually scabrous, punctate on both surfaces, pubescent on the nerves beneath. Petioles 2in. Male peduncles long, 6in.; male flowers often approximate near the summit; pedicels short, each carrying a small ovate-viscid entire bract, sometimes obsolete. Petals 5, $\frac{3}{4}$ -lin., yellow, often with elevated, hairy, green veins. Stamens 5. Female flower solitary, peduncle 1-3in. Fruit elongate, 5-12in., often much longer, clavate, smooth, 10-ribbed, or somewhat 10-angular. Seeds $\frac{3}{8}$ by nearly $\frac{1}{4}$ in., usually black, very narrowly winged, smooth or very sparing, tubercled.

Use:—The seeds are said to be emetic and cathartic, like those of *L. acutangula*. They yield an oil.

The oil is dark reddish-brown in colour, possesses a slight odour and is semi-drying.

Lewkowitsch determined the following constants; Specific gravity at 15°, 0.9254; saponification value, 187.8; iodine value, 108.51; Reichert-Meissl value, 1.43; butyro-refractometer "degrees," 62° at 40°; insoluble fatty acids and unsaponifiable, 94.8. Two samples examined in the Indian Museum were dark greenish in colour, had acid values of 33 and 36.4, and the insoluble fatty acids melted at 34° and 35°. (Agricultural Ledger, 1911-12 No. 5 p. 147).

532. *L. acutangula*, Roxb. H.F.B.I., II. 615; Roxb. 698.

Sans. :—Jhingāka.

Vern. :—Turai (H.); Jhingé (B.); Peekunkai (Tam.); Pee-chenggah (Mal.); Beerakai (Tel.); Janhi (Uriya); Paror jhinga (Santal.); Rām-toroi (Nepal); Turi (Sind.); Dorka (C. P.); Shirolā (Mar.); Turin, Guisoda (Guz.).

Habitat :—North-West India; Sikkim; Assam and Plains of East Bengal.

Extensively climbing, hairy annuals; tendrils 2-3-fid. Leaves 4in. diam., reniform-orbicular, 5-angled or somewhat 5-lobed, dentate, usually scabrous, punctate on both surfaces, pubescent in nerves beneath; petiole 2in. Male peduncles 6in., flowers often approximate near the summit; pedicels short, each carrying a small, entire, viscid bract, sometimes obsolete. Petals 5, obovate, united; stamens 3. Female flowers solitary; peduncle 1-3in. Fruit 5-10 inches, often 2-ft. long, 10-angled, not covered with spines or papilæ. Seeds numerous, close-packed, scarcely $\frac{1}{4}$ in. The flowers open in the afternoon.

Use :—The seeds possess purgative and emetic properties and also yield an oil.

The pounded leaves are applied locally to splenitis, hæmorrhoids and leprosy (Emerson). The juice of the fresh leaves is dropped into the eyes of children in granular conjunctivitis, also to prevent the lids adhering at night from excessive meibomian secretion (P. Kinsley in Watt's Dictionary).

533. *L. acutangula*, *Var* :—*Amara*, H.F.B.I., II. 615; Roxb 699.

Sans. :—Koshātaki.

Vern. :—Karvi-turai (H.); Ghoshālata, Kerula, Tetodhoon-dhool (B.); Ran-turai; Kadu-sirolā, Kadu-dokra (Bomb.); Sendu-beer-kai (Tel.).

Habitat :—Nearly all India, especially the Western side.

Exceedingly near *L. acutangula*, but distinguished by the leaves a little smaller and sometimes whitish. The typical *L. amara* has the leaves softly pubescent at least while young, for they become in age scabrous (C. B. Clarke).

Uses:—Every part of this plant is remarkably bitter, the fruit is violently cathartic and emetic. The juice of the roasted young fruit is applied to the temples by the natives to cure headache. The ripe seeds either in infusion or substance, are used by them to vomit and to purge (Roxburgh). In Bombay, the leaves are used as an external application to sores in cattle. In dog-bite, the pulp of the fruit is given with water; it causes vomiting and purging. The juice is applied to different kinds of bites, and the dried fruit is used as a snuff in jaundice. The root with equal parts of Jasund root (*Hibiscus rosa-linensis*) and Hemidesmus, is given with milk, cumin and sugar in gonorrhœa (Dymock).

In the Indian Pharmacopœia, it is described as a bitter tonic and diuretic, and is recommended in splenic enlargements.

The kernel of the seeds forms the only vegetable emetic in India which is equal to Ipecacuanha, in the same quantity. In smaller doses, it is expectorant and also demulcent, owing to its containing albumen and oil. It has a great control over dysentery. I have used this drug and also Ipecacuanha, separately, in several cases, in the same manner and doses, and found it to be at least quite equal to the latter. The dose of the kernel as an emetic is from 20 to 30 grains, as a nauseant, from 11 to 15 grains, and as demulcent and expectorant, from 5 to 10 grains. When the kernel is rubbed and mixed with water, it forms a greenish white emulsion, which is the only form in which I have yet used it. (Moodeen Sheriff).

The seeds are small (17 weigh one gram.), black, irregularly pitted and two-lobed at the base. On extraction with ether the seeds yielded 20 per cent. of a light green oil. The expressed oil is yellowish-white in colour and solidifies at the ordinary temperature in England (50° Fah., 15-50° C.).

Physical and chemical characteristics....Fat: Specific gravity at 100°, 0.9363; acid value, 93.7; saponification value, 229.2; Reichert-Meissl value, 13.1; titration number of insoluble volatile acids, $\frac{1}{2}$ KOH 0.83; iodine value, 40.12; unsaponifiable, 1.99; butyro-refractometer at 25°, 73°. Fatty acids (insoluble): per cent. 82.3; melting point, 44.1; iodine value, 41.9; neutralisation value, 215; mean molecular weight, 260.9. (A. K. Menon, 1910.)

534. *L. echinata*, Roxb. H.F.B.I., II. 615; Roxb. 699.

Vern.:—Kukar-wel (Bomb.); Jung-thoree (Sind.); the seeds: Wa-upla-bij (Guz.); Deodâgri (Mar.).

Habitat:—Guzerat; Sind; Bengal; Bombay.

An annual, climbing not extensively, sparingly scabrous pilose, tendrils 2-fid. Leaves 1-2 in. diam., cordate reniform, orbicular, entire or obscurely 5-angular or 5-lobed, or cut almost to the base into 5 narrow sinuate-pinnatifid segments, dentate; petiole 1-2 in. Male peduncles normally paired, one 1-flowered, the other racemed very long, 6 in. or more, pedicel 1 in. Flowers small, white, without bracts. Filaments 3, 2 with 2-celled anthers. Peduncle of the solitary female very short. Fruit $1\frac{1}{4}$ by $\frac{5}{8}$ in., ellipsoid densely covered with bristles; ribs not visible; spines $\frac{1}{4}$ in., ciliate; stopple without spines, Calyx-teeth persistent. Seeds $\frac{3}{8}$ in., many slightly scabrous.

Uses:—In the Concan, a few grains of the bitter fibrous contents of the fruit are given in infusion for snake-bite and in cholera after each stool; in putrid fevers, the infusion is applied to the whole body, and in jaundice it is applied to the head and also given internally; the infusion has also a reputation as a remedy for colic (Dymock).

The fruit is considered in North India as a powerful remedy for dropsy (O'Shaughnessy). The fruit has purgative properties (S. Arjun).

535. *Benicassa cerifera*, Savi., H.F.B.I., II. 616.

Syn.:—*Cucurbita Pepo*, Roxb. 700

Eng:—The white melon.

Sans.:—Kûshmânda, Kûsh-pândaha.

Vern.:—Pethâ, gol-kaddû (Pb.); Kumrâ, châlkumrâ (B.); Gôl-kaddû, kudimah, kônhdâ, kumrhâ, pêthâ, phûthiâ (H.); Kumhrâ, bhunja (Kumaon); Kohalâ, Dângar, Bhopala (Mar.); Kûshmând, kohula (Cutch); Bhûru-kolu, koholu (Guz.); Kohala, koholen, gôlkadû, Pândri chicki (Bom.); Gol-kuddu (Sind.); Kaliyâna-pûshinik-kây (Tam.); Burda-gûmûdû, bûdide gummadi, pendli-gummadi-kâya (Tel.); Kumpalannâ; Kumpalam (Mal.); Bûde-kumbala-kâyi (Kan).

Habitat:—Cultivated throughout India.

A large annual climber, softly hairy, tendrils 2-fid. Leaves 4-6 in. diam., cordate, reniform orbicular, more or less 5-lobed.

Petiole without glands, 3-4in. Flowers large, yellow, monœcious, all solitary; without bracts. Male flowers:—Peduncle 3-4in. Calyx-tube campanulate, lobes 5, when young often narrow; leaflike, scarcely serrate. Corolla of 5 petals nearly separate; stamens 3, inserted near the mouth of the tube, anthers exsert, free, one 1-celled, two 2-celled, cells sigmoid. Female flowers:—peduncle 1-2in., Calyx and Corolla as in the male; ovary oblong, densely hairy; style thick, with 3 flexuous stigmas; ovules numerous, horizontal, placentas 3. Fruit green, 1-1½ft., often 2ft. by ½ft., cylindric, fleshy, oblong, pubescent, indehiscent, without ribs, ultimately covered with a white waxy bloom. Seeds many, oblong, compressed, margined, ½ by ⅓in.

Uses:—The fruit possesses alterative and styptic properties, and is popularly known as a valuable antimercurial. It is also said to have cooling properties. It is considered tonic, nutritive and diuretic, and a specific for hæmoptysis and other hæmorrhages from internal organs. The *fresh juice* from the fruit given internally, while a slice of the fruit is at the same time applied to the temples, is said to be an efficacious cure for internal hæmorrhage. According to the Sanskrit authors, it is useful in insanity, epilepsy, and other nervous diseases; the fresh juice is given either with sugar or as an adjunct to other medicines for these diseases (U. C. Dutt).

Is used extensively as a preserve by natives.

“The seeds possess anthelmintic properties, and are useful in cases of tænia. The expressed oil of the seeds, in doses of half an ounce, repeated once or twice at an interval of two hours, and followed by an aperient, is said to be equally efficacious. May be used as a substitute for male fern” (Official Correspondence from Bombay Committee regarding the revision of Indian Pharmacopœia.)

“The fresh juice is often used as a vehicle to administer pearl shell for the cure of phthisis in the first stage” (Asst.-Surgn. Sakhāram Arjun, Bombay). “This is so universally believed to be useful in pulmonary consumption that some

trials should be made in order to discover whether it has any effect on Koch's bacillus tuberculosis. I have seen it produce a decided effect in arresting pulmonary tuberculosis." (Surgn. K. D. Ghose, M.D., Khulna.)

The preserve is given in piles and in dyspepsia, as an antibilious food (Surgn. Moir, Meerut). "The expressed juice of the mature fruit possesses purgative and alterative properties. It is used in cases where the system has been affected by mercury" (Brigade-Surgn. Thornton, Monghyr).

The preserve of the fruit is easily digestible and a highly nutritious food in wasting diseases, as consumption (Surgn.-Maj. R. L. Dutt, Pubna). "Much used in diabetes with successful results" (Surgn. E. W. Savige, Rajamundry, Godaveri District). Watt's Dictionary.

The seeds yield a mild, pale oil.

536. *Momordica Charantia* Linn. H.F.B.I., II. 616; Roxb. 696.

Sans. :—Karavella; Sushavi.

Vern. :—Karela (H.); Karala (B.); Kârlâ (Bomb.); Pavakai, Pāvakkâ-chedi (Tam.); Kâkarachettu (Tel.); Pandipasel (Mal.)

[N.B.—There are two chief varieties differing in the form of the fruit, the one being longer and more oblong, and the other smaller, more ovate, muricated and tubercled. These varieties are known in Bengali as *Karalâ* and *Uchhya*.]

Habitat :—Cultivated throughout India.

A climbing annual herb, with simple tendrils. Leaves 1-3in. diam., orbicular, glabrous or slightly pubescent, cut nearly to the base into 5-7 narrow sinuate or sub-pinnatifid lobes. Male peduncles 1-flowered, orbicular entire. Flowers monœious. Calyx-lobes ovate, acute. Petals $\frac{3}{8}$ - $\frac{3}{4}$ in., yellow. Female peduncle 2-4in., slender, bracteate near the base; ovary fusiform, muricate. Fruit 1-3in., rostrate, ovate, narrowed at both ends, many-ribbed, covered with triangular tubercles. Seeds $\frac{1}{2}$ in.,

compressed, corrugate on the margin, somewhat sculptured (Clarke).

Uses.—The author of the *Makhzan* describes the fruit as tonic and stomachic, and says that it is useful in rheumatism and gout, and in diseases of the spleen and liver; he also mentions its anthelmintic properties. In the Concan, $\frac{1}{2}$ of the seer of the juice of the leaves is given in bilious affections, as an emetic and purgative, alone or combined with aromatics; the juice is rubbed in burning of the soles of the feet, and with black pepper is rubbed round the orbit, as a cure for night blindness (Dymock).

It is used internally as a laxative, and as an ointment for sores. The fruit and leaves are anthelmintic; useful in piles, leprosy, jaundice and as a vermifuge. The root is considered astringent and useful in hæmorrhoids. The juice of the fresh leaves acts as a mild purgative, and is prescribed for children. The *Uchhya* (*M. Muricata*) in infusion is said to act as a febrifuge (Watt.)

Used with cinnamon, long pepper, rice and the oil of *Hydnocarpus Wightiana*, as an external application in scabies and other cutaneous diseases (Watt).

The expressed juice with chalk is used in apthæ, and also an emmenagogue in dysmenorrhœa. It is applied externally to the scalp in pustular eruptions (Surgeon-Major Thomson, in Watt's Dictionary).

Commonly prescribed as an anthelmintic, and as a purgative for children (Dr. McConaghey, in Watt's Dictionary).

537. *M. Balsamina*, Linn. H.F.B.I., II., 617.

Vern.—Kurelo-jangro (Sind.); Mokha (C.P.).

Habitat.—Panjab; North-West India; Sindh.

Botanically, it resembles *M. dioica*. Fruit 1-3in. long, rostrate, orange-red.

Use.—The fruit is occasionally used in native practice (Atkinson).

The fruit is famous in Syria for curing wounds. It is cut open, infused in sweet oil, and exposed to the sun for some days, until it becomes red, and then it is preserved for use;

dropped on cotton, and applied to a fresh wound, it is considered as a vulnerary, little inferior to the balsam of Mecca (Ainslie).

538. *M. dioica*, Roxb H.B.F.I., II. 617; ROXB. 696.

Vern.:—Dhâr karela; Kirara (Pb.); Karantoli (Bomb.) Pallopaghel-kalung (Tam.); Agakara (Tel.); Erimapasel (Mal.); Ghosal-phul (U. P.).

Habitat:—Throughout India: cultivated in Bengal; common in low country, Ceylon. Lower Bengal, form of fruit large succulent. Dekkan: fruit smaller. Fruit from the Panjab, smaller and said to be bitter.

Perennial climbing herbs, with tuberous roots. Tendrils simple. Stems somewhat compressed and 2-edged, striate, glabrous and shining; leaves variable, 2-4in., broadly ovate in outline, very cordate at base, acute, more or less deeply cut, into 3 or 5 lobes, distantly dentate or denticulate, thin, quite glabrous and shining on both sides, minutely punctate beneath; petiole 1-1½in., pubescent, channelled above. Flowers dioecious, solitary, peduncle about 2in., slender, glabrous, or finely pubescent; in the male, with a large hooded bract a little below the flower and enclosing it; in the female, with a minute bract below the middle. Calyx-segments distant, linear; petals ½-lin., lanceolate, acuminate, slightly pubescent. Female flower: ovary densely covered with long soft papillæ, stigmas bifid, with erect torus. Fruit about 2in. long, oblong-ovoid, beaked, glabrous, evenly covered with equal-pointed papillæ. Seeds ½-lin., broadly oblong, compressed, rarely smooth; pulpy covering red. Fruit by some said to be bitter; that of cultivated plants edible, not bitter, or slightly so, if at all, used as vegetable. Flower pale, lemon-yellow.

Use.—The plant mixed with cocoanut, pepper, red sandal, and other ingredients, applied in the form of liniment, relieves headache. (Rheede.)

The mucilaginous tasted root is used by the Hindus to stop bleeding from piles, and also in bowel complaints (Ainslie).

In the Concan, the juice of the root is a domestic remedy for the inflammation caused by contact with the urine of the house-lizard (Pál) (Dymock).

The powder or infusion of the dried fruits, when introduced into the nostrils, produces a powerful errhine effect and provokes a copious discharge from the schneiderian mucous membrane (Agra Exhibition).

The tuberous root of the female plant is used in Belgaum as an expectorant, and externally in ague cases as an absorbent. The root of the male creeper is used in ulcers, especially those caused by snake-bites. The unripe fruit is used as a vegetable and given as a delicacy to patients recovering from fever. (Dr. Peters, in Watt's Dictionary).

539. *M. cochinchinensis*, Spreng., H.F.B.I., II. 618.

Sanskrit:—Karkataka.

Vern.:—Kakrol (H. and B.).

Habitat:—Bengal to Tenasserim; Deccan Peninsula; Canara.

An annual climber, with simple tendrils, dioecious. Leaves, 4-5in. diam.; cordate, ovate, usually 3-lobed, glabrous or a little pubescent, often punctate beneath, little dentate; petiole 2-3in., almost invariably glandular at its middle as well as apex. Bract near the top of the male peduncle. Male peduncle 2-6in., bract often pubescent, embracing the expanded flower. Petals 1-2in., tinged with yellow, 3 with black spots at the base, 2 with yellow glands; the two 2-anthered filaments not 2-fid. Female peduncles 1-2in., bract small, about the middle. Fruit 4-5in., ovate, pointed, muricate, conical points $\frac{1}{8}$ in. high, bright red, very fleshy, without ribs. Seeds $\frac{7}{8}$ by $\frac{5}{8}$ and $\frac{1}{2}$ in. thick, many, horizontal, irregular, ovate, compressed, black, corrugated on the margins, sculptured on the faces (C. B. Clarke).

Uses:—The seeds, after the shells have been removed, are fried and eaten, either alone or with other food (Makhzan). They are considered to be good for cough and pains in the chest. Powdered, they form one of the ingredients of the hot stuff known as *jhal* in Bengal, which, mixed with melted butter, is given to women immediately after parturition, and daily for a few days afterwards. *Jhal* is believed to act as a

stimulant destroying the excess of phlegmatic humours, which are supposed to be produced in the body after delivery.

A plaster made with the roots is said to promote the growth of the hair, and prevent its falling off. The plant is called in Sanskrit Karkataka, from the resemblance of the seeds to the shell of a crab. This plant is the *Muricia cochinchinensis* of Loureiro, who says that the berries are used for colouring food, and that the seeds and leaves are aperient and abstergent and useful in hepatic and splenic obstructions, in unhealthy ulcerations, lumbago; and, externally, in prurientia uteri-et-ani, fractures, and luxation of the bones (*Pharmacographia Indica*, Vol. II. p. 77).

540. *M. Cymbalaria*, Fenzl. H.F.B.I., II. 618.

Syn.:—*Luffa tuberosa*, Roxb. 699.

Vern.:—Kadavanchi (Mar.).

Habitat:—Deccan Peninsula; Mysore and Concan.

A monoecious climber, leaves 1-2 in. broad, reniform-orbicular, 5 angular or slightly 5 lobed, middle lobe not elongated, glabrous or slightly pubescent, often punctate on both surfaces, dentate; petiole $\frac{1}{2}$ -1 $\frac{1}{2}$ in. Flowers small, males few on one raceme with inconspicuous bracts. Male raceme 1-2 in., with usually only 2-4 flowers; calyx-lobes laceolate; petals $\frac{1}{4}$ in., yellow; filaments 2, one 2-fid, one 3-fid, so each with one anther-cell; filaments inserted near the top of the calyx-tube, anthers completely exsert. Female peduncle $\frac{3}{4}$ -2 in., 1-flowered, ebracteate. Fruit $\frac{3}{4}$ by scarcely $\frac{1}{4}$ in. Seeds $\frac{1}{8}$ - $\frac{1}{4}$ in., few, shortly obovoid, smooth, shining. (C. B. Clarke).

Use:—Dr. Lyon, the Chemical Analyser to the Government of Bombay, informs me that on reference to the records of his office, he finds that the kadavanchi tubers have been three times sent to him, within the last four years, as having been used to procure abortion (Dymock).

541. *Cucumis trigonus*, Roxb. H.F.B.I., II. 619; Roxb. 700.

Vern.:—Bislômbi, Bislambhi, Jangli-indrâyan (H.); Kâttut-tumatti (Tam.); Adavi-puch-cha (Tel.). Karit (Bomb.).

Habitat :—Throughout India.

A climbing, annual, scabrid herb. Root perennial. Leaves 5-lobed, lobes rounded, repandly and sharply toothed; male flowers crowded; female solitary. Fruit oval, rounded at both ends, obsolete 3-angled, 10-striated, glabrous, about 1½ in. long and 1¼ in. thick. Lobes of the leaves very broadly obovate and almost touching each other at their broadest part; veins rounded.

The fruit is collected in many places and sold in the bazars as a drug, and very probably as an adulterant for the true *colocynthis* (Duthie).

Use :—Supposed to possess purgative properties of *Colocynthis* (Watt).

It contains a principle identical with or closely related to colocynthin.

Var :—Pubescens.

Vern. :—Takmaki (Bomb.).

Use :—The seeds are considered cooling, and are applied to Herpes, after they have been beaten into a paste with the juice of the *Durvâ* (*Cynodon dactylon*) (Dymock).

It is considered cool and astringent; it creates appetite and removes bilious disorders (Baden-Powell).

Var. :—*C. pseudo-colocynthis*, Royle.

This is a synonym for *Cucumis trigonus*, Roxb., as cited by C. B. Clarke, H. F. B. I., Vol II, p. 619. This is described by Royle in his Illustrations of the Himalayan plants.

Vern. :—Indrâyan; Bislumbhi (North India); Karit (Bomb.); Hattut-tumatti (Tam.); Adavi-puch-cha (Tel.).

Habitat :—Met with throughout the Deccan and Sind to Baluchistan, Kashmir and Afghanistan.

Use :—Pulp of the fruit is very bitter and similar in quality to colocynthis, for which it is substituted (O'Shaughnessy). Supposed to possess the purgative properties of officinal colocynthis. Dr. Gibson, however, expresses a doubt as to the correctness of this opinion. Experiments are required to determine the point. According to the report of Dr. J. Newton, a decoction of the roots of these plants is used as a purgative; it is

stated to be milder in its operation than the pulp of the fruit, and to cause less irritation (Ph. Ind., p. 96).

542. *C. Melo*, Linn. H.F.B.I., II. 620; Roxb. 700.

Vern.:—Kharbûzâ (H.); Kharmuj (B.); Vellari-Verai (Tam.); Mulam-pandu (Tel.); Dungra (C. P.); Chibunda (Mar.); Gidhro (Sind.); Zaghun (Ladak); Sardâ or Sirdâ paliz (Pushtu); Re-mo (Naga.).

Habitat:—Cultivated throughout India.

Annual herb. Stems prostrate, scabrous. Leaves rounded, angled; male flowers, with the Calyx-tube slightly ventricose at the base and dilated at the apex: stamens included, anthers shorter than the connective. Bisexual flowers with the anthers as the male; stigmas 3-4, shortly 2-lobed. Fruit ovate or somewhat globose, 8-12-furrowed, fleshy, indehiscent or irregularly bursting. Seeds ovate, compressed, not margined, acute at hilum.

Uses:—The seeds are supposed to be a cooling medicine. They are edible, nutritive and diuretic, and used in painful discharge and suppression of urine.

The fruit is considered cool and astringent, and is given in cases of dyspepsia. The oil from the seeds is said to be very nourishing.

Not only the seeds, but the pulp of the fruit, is a powerful diuretic, very beneficial in chronic, and also in acute, eczema. I can, from personal experience, recommend those subject to chronic eczema to eat a whole fruit daily when procurable (Surgeon-Major Shircore, in Watt's Dictionary).

The root of the melon is said by Dr. Heberger to possess emetic and purgative properties, and Dr. Torosievicz has obtained from the roots a crude emetic principle by treating the aqueous extract with alcohol. * * From experiments made with this substance in the military hospital of Lemberg, it would seem that a solution of 9 centigrams of it, is sufficient to cause vomiting. The powdered root of the wild plant acts, according to Dr. Langewicz, as an emetic, in doses of 50 to 75 centigrams (Ph. J., 26th Feb., 1887, p. 687).

*Var. (1) momordica, Roxb. 700.**Sans.* :—Ervâru.*Vern.* :—Phût or phûnt (ripe); Kachra (when unripe); Tuti (H.); Phûti (B.); Kakari-kai (Tam.); Pedda-kai, Pedda-dosrai (Tel.).

An annual herb, cultivated. Stem scabrous. Leaves roundish cordate, sometimes 5-angled or obscurely lobed, repand-toothed: Flowers short peduncled, males fascicled, female solitary. Petals slightly acute. Fruit cylindric-oblong, straight, 4-times larger than thick, bursting spontaneously, 12-14 in. long.

Use :—The seeds are used as a cooling medicine (Watt).*Sans.* :—Karkati.*Var. (2) utilissimus Roxb. 701.**Vern.* :—Kakri, (H.) Kâkur (B.); Kukri (Kangra); Dosray, Velliri, Kakkarik (Tam.); Kâkâdi (Bomb.); Kâkdi (Dec.); Târkâkdi (Poona).*Habitat* :—Cultivated in Bengal, U. P. and the Punjab, during the hot weather and the rains.

Stems exactly as in *C. sativus*, but not quite so extensive. *Tendrils* simple. *Leaves* broadcordate, generally more or less five-lobed; lobes rounded, toothletted; above pretty smooth, below scabrous, the largest generally about 6 inches each way. *Floral leaves* of the female flowers sessile, and very small. Male flowers axillary, peduncled, crowded, but opening in succession. Female flowers axillary, peduncled, solitary, both sorts yellow, about an inch or an inch and a half in diameter. *Fruit* fleshy, generally a very perfect oval; when young downy and clouded with lighter and darker green; when ripe perfectly smooth, variegated with deeper and lighter yellow; from four to six inches long, and from three to four in diameter (Roxburgh).

Uses :—The seeds are described as cooling, edible, nutritive and diuretic, and are used in painful micturition and suppression of urine. Two drachms of the seeds, rubbed into a pulp with water are given alone or in combination with salt and *Kânjika* (U. C. Dutt).

The powder of the toasted seeds is described as a powerful diuretic, and serviceable in promoting the passage of sand or gravel (Roxburgh).

543. *C. sativus*, Linn., H.F.B.I., II. Roxb. 700.

Sans.:—Sukasa; Trapusha.

Vern.:—Khîrâ (H.); Sasâ (B.); Muhevchri (Tam.); Doza-kaia (Tel.); Kakuri (Orissa); *Kâkdi* (Mar.); Sante kayi (Kan).

Habitat:—Cultivated throughout India.

The cucumber is a cultivated, climbing, annual, hispid. Tendrils simple. Stems scabrous. Leaves 3-5 in. diam., ovate, 5-angular, slightly lobed, lobes acute, hispidulous on both surfaces and also often with soft hairs; petiole 2-3 in., peduncle sometimes 2 in. Petals $\frac{5}{8}$ in. Female flowers yellow monœcious, males clustered in axils. Females solitary, all shortly pedicelled. Male:—Calyx-tube top-shaped or campanulate, lobes 5. Stamens 3. Anthers free, one 1-celled, two 2-celled, cells conduplicate or much flexuose. Female Calyx and Corolla as in male. Ovary ovoid; young ovary muricate, with rigid prickles; style short, with three obtuse stigmas. Fruit commonly cylindric, indehiscent, 12 in. by 1½ in., glabrous, sometimes tuberculated. Commonly elongate. Seeds very many, oblong, compressed, mostly smooth.

Uses.—The seeds possess cooling properties. They are also used as diuretics.

The leaves, boiled and mixed with cumin seeds, roasted and powdered, are administered in throat affections (Atkinson).

Cucumber seeds are occasionally pressed for oil in the United Provinces and the Punjab. The constants of two samples were tested in the Indian Museum and found to be: Specific gravity at 15°, 0.923 and 0.924; acid value, 10.68 and 11.49; saponification value, 195.2 and 196.9; iodine value, 117.6 and 118.5; Reichert-Meissl value, 0.52; fatty acids and unsaponifiable, 94.4 per cent.; melting point, 35.5°. The oil were yellow coloured and dried slowly on exposure. (Agricultural Ledger 1911-12 No. 5).

544. *Citrullus colocynthis*, Schrad. H.F.B.I., II. 620.

Syn.—Cucumis Colocynthis, Linn. Roxb., 700.

Sans.—Indra-vârûni.

Arab.—Hanzal; Aulqum.

Pers.—Hindawânahe-talkh.

Vern.—Indrâyan (H.); Mâkal (B.); Pey-ko-mati, Tumatti (Tam.); Eti-puch-cha, Putsa-kaya (Tel.); Kadû Indrâyan (Mar.)

Habitat.—Cultivated throughout India, and also very often apparently wild.

A scabrid climber. In the fields of Afghanistan, it trails along the ground extensively. Leaves $2\frac{1}{2}$ by scarcely 2in. in the typical wild very scabrous form, larger in cultivated forms approaching *C. vulgaris*, ovate, middle segment compound pinnatifid. Petiole 1in. Petals $\frac{1}{4}$ in., obovate, light-yellow. Ovary villous. Eruit smooth, variegated, green and white globose, $2\frac{1}{2}$ -3in. diam.

Parts used.—The fruit and root.

Use.—Sanskrit writers describe the fruit as bitter, acrid, cathartic and useful in biliousness, constipation, fever and worms. They also mention the root as a useful cathartic in jaundice, ascites, enlargement of the abdominal viscera, urinary diseases, rheumatism, etc.

Mahomedan writers consider it to be a very drastic purgative, removing phlegm from all parts of the system, and direct the fruit, leaves and root to be used. The drug is prescribed when the bowels are obstinately costive from disease or lesion of the nervous centres, also in dropsy, jaundice, colic, worms, elephantiasis, &c. Its irritant action upon the uterus is noticed, and fumigation with it is said to be of use for bringing on the menstrual flow. The author of the *Makhzan* tells us that the seeds are purgative, and mentions their use for preserving the hair from turning grey (Dymock).

In the Concan, the fruit and root, with or without nuxvomica, is rubbed into a paste with water and applied to boils and pimples. In rheumatism, equal parts of the root and long pepper are given in pill. A paste of the root is applied to the enlarged abdomen of children (Dymock).

It is officinal in both Indian and British Pharmacopœias.

From experiments with colocynthin obtained from *Citrullus colocynthis*, Messrs. Naylor and Chappel find that this substance is capable of hydrolysis, and that it yields, amongst other products, colocynthein, elaterin, and dextrose. They were also able to obtain colocynthin in a crystalline form.

[Pharm. J. 1907 Vol. 79 pp. 117-118.]

The seeds of the wild colocynth are used for food in Sind and Baluchistan; the kernels are roasted or boiled and eaten with dates. The seeds

yield to solvents about 17 per cent. of yellowish-red oil having an indine value of 129.3, and 92.2 per cent. of fatty acids melting at 29°. Grimaldi and Prussia, in 1909, found the oil of colocynth seeds to have the specific gravity of 0.9289, solidifying point 14°, and iodine value 120.27. Power and Moore (1910) separated from the oil a phytosterol, melting between 158° and 160° C. The oil has a bitter taste if made from the uncorticated seeds (Hooper).

545. *C. vulgaris*, Schrad., H.F.B.I., II., 621.

Syn.—*Cucurbita citrullus*, Linn. Roxb. 700.

Vern.—Tarbûz (H.); Tarmuj (B.); *Tarbuji*, Kālingad or Kalingan (Bomb.); Pitcha-pullam (Tam.).

Habitat.—Cultivated throughout India.

A climbing or trailing, hispid annual. Stems branching, angular; tendrils 2-fid, firm; pubescent. Petioles about 2 in., nearly round, villous; blade of leaf 3-5 in. long by 2-3 in. broad, triangular-ovate, cordate, deeply trifid; segments pinnatifid, terminal one larger; lobes undulate or lobulate, pale-green above, ashy beneath. Flowers monœcious, axillary, solitary, rather large. Male flowers:—peduncle falling short of the petiole; Calyx campanulate, lobes narrowly lanceolate, equalling the tube; Corolla about an inch in diam., greenish outside, and villous; segments ovate, oblong, obtuse, 5-nerved. Stamens 3, anthers free. Female flowers:—Calyx-tube, fused with the ovary, contracted above, lobes and Corolla as in the male; ovary ovoid; densely villous; style short, stigmas 3. Fruit large, ovoid, pale or dark-green or mottled, sometimes covered with a glaucous waxy bloom; flesh white, yellowish or red, at times deeply pink. Seeds compressed, and usually margined, varying much in shape and colour. Some of the varieties grown in Alibag in the Kolaba District, have a glaucous green globose fruit. (K. R. K.)

The wild plant may be either bitter or sweet without any observable structural differences. The bitter form comes very close to *C. colocynthis*, when that species is cultivated (Watt).

Uses.—The seeds are used as a cooling medicine. In Bombay, they are considered cooling, diuretic and strengthening.

The juice is used with cumin and sugar as a cooling drink (Dymock). The Vytians prescribe the juice of the fruit to quench thirst, and also an antiseptic in typhus fever (Ainslie).

The bitter water-melon is in Sind known as *kirbut* and is used as a purgative medicine (Watt).

Var.—*fistulosus*, *Stocks*, H.F.B.I., II. 621.

Vern.—Tandus, tendu, tinda, (H and Pb.)

Habitat.—"This seems a peculiar form fairly local and much less known than the preceding. Chiefly met with in the United Provinces, Panjab and Sind, where it is specially designated *dilpasand*. Cultivated along with other melons from April—October." (Sir George Watt).

It has thick stems, leaves sparingly lobed, and is plentifully supplied with long somewhat hispid hairs.

Use.—"The seeds are used medicinally."

546. *Cephalandra indica*, *Nand.* H.F.B.I.II., 621.

Syn.—*Momordica monadelpha*, *Roxb.* 694; *Coccinia indica* W. and A.

Sans.—Vimba.

Vern.—Kanduri, Ghol, Kúndrú (Pb.); Telákuchi (B.); Tondlá or Bimbi (Bomb.); Korai (Tam.); Bhinb, Kanduri-kibel (H.); Goláru, Kanduri (Sind.); Ghobe, gluru, galedu (Guz.) Tonde-balli (Kan.).

Habitat.—Throughout India; wild in the hedges of the Concan, in the rains as well as cultivated in the rainy season principally.

A climbing annual herb, scarcely hairy, tendrils simple. Leaves 2-4in. diam., 5-angular, occasionally 5-lobed, pupillose scabrid, distantly finely toothed, petiole lin. Male flowers: Peduncle lin., jointed below the flower; Calyx-lobes linear oblong; Corolla white campanulate, nearly lin; lobes 5, long triangular. Stamens 3; anthers exsert, connate, one 1-celled, two 2-celled; cells conduplicate. Ovary smooth oblong, style long, with trifid stigmas. Ovules many, horizontal.

Female Calyx and Corolla as in male, peduncle about $\frac{1}{4}$ in. Fruit bright scarlet when ripe, fleshy, indehiscent, cylindric smooth, 1-2in. by $\frac{1}{2}$ -lin. Seeds many, ovoid.

Uses.—The expressed-juice of the thick tap-root of this plant is used by the native physicians (kavirâjes) as an adjunct to the metallic preparations prescribed by them in diabetes. I know several patients who were benefited by the juice. It is very desirable that its therapeutic action should be tested (U. C. Dutt).

In the Concan, the root pounded with the juice of the leaves is applied as a *lep* to the whole body to induce perspiration in fever, the green fruit is chewed to cure sores on the tongue (Dymock).

This is a favourite remedy with the native practitioners (London Exhibition, 1862).

The bark of the root, dried and reduced to powder, is said to act as a good cathartic, in a dose of 30 grains (Taylor's Topography of Dacca).

The leaves, mixed with *ghi*, are applied as a liniment to sores. The whole plant, bruised and mixed with the oil of *Euphorbia nuriifolia* and powdered cumin seeds, is administered by natives in special diseases (Atkinson). The leaves are applied externally in eruptions of the skin, and the plant internally in gonorrhœa (Balfour).

547. *Cucurbita maxima*, Duchesne, H.F.B.I., II.
622.

Vern.—Mitha kaddu (H.); Suphurú kúmra (B.); Pushinik-kay (Tam.); Gummadi-kaya (Tel.). The seeds: Lálabhopalábija (Mar.)

Habitat.—Cultivated throughout India.

A large, climbing, hairy annual herb. Tendrils 2-4-fid. Leaves 4-6 in. diam., hispidulous and also with much soft hair, denticulate, with 5 shallow lobes or subentire; sinus between the lobes narrow. Hairs of the petiole equal, not pungent. Petiole often nearly as long as the blade. Flowers monœcious, all solitary, white, very large. Male flowers:—Calyx-tube green, campanulate, 5-lobed, hardly half-way down; stamens 3, inserted low in the Calyx-tube; segments lanceolate-linear;

anthers connate, one 1-celled, two 2-celled, cells conduplicate. Corolla 3-4 in. Male peduncle 4 in. Female Calyx and Corolla as in the male. Female peduncle 1½ in., fruiting peduncle stout, corky striated, not grooved. Ovary oblong, style short, stigmas 3, bifid; ovules very many, horizontal; placentas three. Fruit fleshy, indehiscent, often large; pulp yellow. Seeds, ovoid or oblong, compressed, about half an inch long, ½ in. broad.

Uses.—The seeds are used medicinally. The oil is used as a nervine tonic. The pulp of the fruit is often used as a poultice (Watt).

An ounce of the seeds fried with their husks, mixed with sugar, and taken at bed time, and in the morning, followed by Castor oil, has been found an effectual anthelmintic in tape worms (S. Arjun).

The part of the fruit stalk in *immediate* contact with the ripe gourd, is removed and dried, and when made into a paste by rubbing in water, is considered a specific for bites of venomous insects of all kinds, chiefly for that of the centipede (P. Kinsley, in Watt's Dictionary).

Four samples of the oil received in the Indian Museum from Allahabad, Cuddapah, Punjab and Mandalay, were examined in 1907. The first three were yellow in colour, while the fourth was greenish-brown and fluorescent; they solidified about zero (Centigrade). The following maximum and minimum constants were noted: Specific gravity at 15°, 0.919 to 0.926; acid value, 6.38 to 17.65; saponification value, 194.9 to 197.1; iodine value 88.7 to 133.4; Reichert-Meissl value, 0.48 to 0.67; fatty acids and unsaponifiable, per cent. 94.3 to 95.8; melting point, 32° to 38°. (Agricultural Ledger 1911-12 No. 5).

548. *C. Pepo*, *De. H.F.B.I.*, II. 622; *Roxb.* 700.

Vern.—Kumra (B.); Safed Kaddu (H); Kaula (Bomb.); Kohala (Mar.); Kumbala kagi (Kan.); Petha (Pb.); Pottigummadi, Budâde gummadi (Tel.); Pâni-kakharu (Orissa).

Habitat.—Cultivated throughout India.

An annual extensive climber. Tendrils 2-4 fid. Leaves 5-lobed, roughly bristly, almost prickly; sinus between lobes broad. Blade 4-6 in. diam., softly hairy when young, hispidulous on the nerves beneath, denticulate, lobes acute, often slightly lobed; petiole often nearly as long as the blade; hairs on the

petals beneath rigid, almost prickly. Flowers large, monœcious, all solitary; peduncles obtusely angled. Male peduncle 4 in., or more. Female peduncle 1½ in., strongly 5-8 ridged, woody and with intervening deep grooves, usually enlarging next the fruit. Corolla yellow, 3-4 in. Fruit fleshy, large, round, mostly yellow to orange, smooth, the flesh not hardening; hollow interior of the fruit traversed by coarse and separate soft or pulpy threads. Seeds oblong or ovoid with a tip, margin slightly winged, raised.

Uses:—The seeds are supposed to possess anthelmintic properties. The Indian Pharmacopœia advocates trials of these seeds being made.

The leaves of this plant are used as external applications for burns (Atkinson).

“The seeds are largely used for flavoring certain preparations of Indian hemp, and the root for a nefarious purpose, viz. to make the preparation more potent.” (Watt).

The husks contain a Xylem, as Xylose crystals have been isolated from the syrup obtained after the husks had been hydrolysed with sulphuric acid. A galactan is also present, as the mother liquors from the Xylose crystals yield mucic acid when oxidised.—J. Ch. S. Abs. 1907, p. 806.

The oil has been examined by Poda (1898), Graham (1901) and others, and the constants do not differ widely from those found in the oil expressed in India.

Specific gravity at 15°, 0.923 to 0.928; solidifying point, —16°; saponification value, 188.7 to 195.7; iodine value, 121.0 to 130.7; Reichert-Meißl value, 0.43 to 0.52; refractive index at 25°, 70.2 to 72.5; insoluble fatty acids and unsaponifiable, 94.7 to 96.2 per cent., melting at 28.4° to 32°. Power and Salway (1910) determined the composition as glycerides to be; linolic acid 45 per cent., oleic acid 25 per cent., palmitic and stearic acids 30 per cent., and a phytosterol.

The cold drawn oil and the seeds are used for edible purposes; the lower qualities of pumpkin seed oil serve as a burning oil. (Agricultural Ledger 1911-12).

549. *Bryonia laciniosa*, Linn. H.F.B.I., II. 622; Roxb. 703.

Vern.:—Gargoo-naroo (H.); Mala (B.); Kardaleche-dole, Sivalinga, popti, kandon (Bomb.); Nehœmaka (Mal.); Lingadonda (Tel.).

Habitat:—From the Himalaya throughout India.

Perennial herbs, climbing, with 2-fid tendrils. Rootstock large, tuberous. Stems very slender, glabrous, often spotted with darker green; internodes very long. Leaves 3-5 in., ovate-rotundate in outline, very deeply cordate at base, cut nearly to the base into 5-lanceolate or linear-acute, coarsely serrate segments, the two basal ones deeply pedate, glabrous, thin, the upper surface slightly rough, with minute scattered scales. Petiole 1-1½ in. Flowers very pale yellow, in small clusters of 3-6, on short pedicels. Calyx-segments linear, filiform. Corolla-segments oval-oblong, acute, pubescent. Fruit globose, over ¾ in. diam., smooth, bluish green, with broad, white, vertical stripes. Seeds ½ in. gibbous at sides, with a prominent raised band round the edge.

Use:—The whole plant is collected when in fruit for medicinal use. It is bitter and aperient, and is considered to have tonic properties (Dymock).

550. *Mukia scabrella*, Arn. H.F.B.I., II. 623.

Syn.:—*Bryonia scabrella*, Linn., f. Roxb. 702.

Vern.:—Bilari, agumaki (H.); Gwâla-kakri (U. P.); Chirâti, bellari (Sind.); Musu-musuk-kai (Tam.); Kutarubudama, putribudinga (Tel.); Chirâti (Mar.).

Habitat:—Common throughout India.

Perennial herbs; tendrils simple. Stems climbing, long, slender, much-branched, angular, very hispid, with spreading bristly hairs, young parts covered densely with white hair. Leaves variable in size, usually 3-4 in., but often only lin. or less, deltoid-ovate, very deeply cordate at base, with a white sinus, and the rounded lobes often overlapping, acute or obtuse at apex, rather shallowly 5-lobed, coarsely dentate-serrate, usually scabrous, with stiff hairs on both sides. Petiole fully half as long as the leaves, cylindric, very hispid. Flowers very small, males on sessile peduncles as long as calyx; females nearly sessile. Calyx hairy, segments linear. Petals ovate, ciliate, a little longer than Calyx-segments. Berry about ½ in., broadly ovoid, apiculate, with a few scattered hairs. Fruit scarlet

when ripe. Seeds horizontal, closely packed, oval, compressed in pulp. Flowers all the year, yellow (Trimen).

Uses:—The seeds in decoction are sudorific. The root, similarly prepared, is useful in flatulence, and, when masticated, relieves toothache (Atkinson). The tender shoots and bitter leaves are used as a gentle aperient and recommended in vertigo and biliousness (Dr. Peters, in Watt's Dictionary).

551. *Zehneria Hookeriana*, Arn., H.F.B.I., II. 624.

Vern.:—Bân-kândri (Chutia Nagpur).

Habitat:—North Bengal; common in Sikkim, Assam, Khasia, and Cachar. Deccan Peninsula and Ceylon, common; apparently always in the lower hills.

A climbing herb, with simple tendrils. Stem weak, nearly glabrous. Leaves cordate, acute, simple or angular, or 3-5-lobed half-way down, generally asperous above, and hairy beneath. Petiole larger than the auricles. Ovary glabrous, even before the expansion of the flower. Fruit 3-8 in. diam. when dry, reticulate, rugose, globose. Seeds much flattened, oblong, margined, smooth or slightly tuberculate on the faces.

Use:—Root used with milk in fever and for diarrhœa (J. J. Wood's Plants of Chutia Nagpur, p. 106).

552. *Z. umbellata*, Thwaites, H.F.B.I., II., 625.

Syn.:—*Momordica umbellata*, Roxb. 697.

Vern.:—Anant-mul, Tarali (H.); Kudari (B.); Gometta or Gometti (Bomb.); Tid-dândâ (Tel.); At (Santal); Gulkukru, Gulale-kukrigulârki (Kullu); Bankakra (Chamba) (Pb.).

Habitat:—Very common throughout India. This plant I found growing wild in my Ratnagiri garden, Outram House, 1898 to 1904 (K. R. K.).

Uses:—In the Concan, the juice of the root with cumin and sugar is given in cold milk as a remedy for spermatorrhœa, and the juice of the leaves is applied to parts which have become inflamed from the application of the marking-nut juice. As a *Paustik*, or restorative and fattening medicine, roasted onions, Gometta root, cumin, sugar and ghi are given, or Gometta only with milk and sugar (Dymock).

553. *Rhynchocharpa fætida*, Schrœd., H.F.B.I., II. 627.

Syn. :—*Bryonia pilosa*, Roxb. 703.

Vern. :—Appakovay kalung (the root) (Tam.); Cucumadunda (Tel.).

Habitat :—Guzerat; Deccan Peninsula; and Malabar hills.

A fœtid, scaberulous-pubescent, climbing herb; tendrils simple, stem somewhat stout, pubescent. Leaves 2 in. diam., orbicular or ovate, cordate, dentate; petiole $\frac{1}{2}$ -lin. Male racemes small, scarcely 1 in. Calyx hairy, with subulate teeth. Connective of each anther produced into a long, curved pointed horn. Stigmas 2. Fruit $\frac{1}{2}$ in., globose, pubescent, beak nearly $\frac{1}{4}$ in., bright red, 2-celled. Seeds 4-6, lin., distinctly margined.

Use :—Ainslie says that the root is prescribed internally in electuary, in cases of piles, and in powder is sometimes ordered as a demulcent in humoral asthma.

554. *Corallocarpus epigæa*, Hook., H.F.B.I., II. 628.

Syn. :—*Æchmandra epigæa*, Arn.; *Bryonia glabra*, Roxb. 702.

Vern. :—Akás-gaddah (H. and Dec.); Kadwi-nai (Bomb.); Gollan-kovaik, akásha-garudan (Tam.); Nága donda (Tel.); Kollan-kova-kizha-una (Mal.); Akásha-garuda-gadde (Kan.).

Habitat :—Punjab, Rawalpindi; Scinde and Guzerat; Deccan Peninsula and Belgaum.

A small, herbaceous, annual climber. Root very large, turnip-shaped, often irregular. Throws out foliage in the early part of the rains; flowers between July and September. Seed mature in the cold weather. Stem roundish, rather succulent, prostrate, glabrous, glaucous (Trimen), seldom as thick as a quill, jointed, often bending at right angles at the joints, or "flexuose," as Wight calls it. Tendrils simple, in the older branches very much-branched, distinctly lateral. Leaves rather small, 1-1 $\frac{1}{2}$ in. long, rotundate, very cordate sometimes at base. More or less 3-5 lobed. Lobes obtuse

or acute, irregularly or slightly dentate. Wight says: "The leaves are sometimes only obtused-angled, densely covered on both sides with short bristly hairs." This is something more than being pubescent as described by Trimen. Wight's description is more accurate as regards Indian species. Petiole more than half the length of the leaf, stout glabrous, and somewhat round, often bent to give the leaf a deplexed appearance. Flowers unisexual, monœcious, yellowish green. Male flowers very small, on short pedicels, more yellow than the female flowers. Inflorescence. "A small corymb at the apex of a long peduncle" (C. B. Clarke). Peduncle roundish, smooth, straight, stiff. Bracteoles present at the insertion of the pedicels. Pedicels short, $\frac{1}{4}$ - $\frac{1}{2}$ in., sometimes 1 in. Calyx campanulate, lobes 5, short. Corolla 5-partite. Stamens 5 (arranged 2+2+1), that is, 2 sets of stamens united, forming a bundle each of two filaments and one solitary, nearly sessile, at the mouth of the Calyx-tube. Connective very small. Anthers free, 1-celled, straight, oblong, not produced; no rudimentary gynœcium in the male flowers. Females axillary, solitary, in the same or different axils from those of the male flower, or accompanied with a small raceme; larger than the male. Ovary inferior, ovoid, of three carpels united into one cell. Ovules 6-9, horizontal; stigmas 3, styles 3, distinct, short. Fruit $\frac{3}{8}$ in., often $\frac{1}{2}$ - $\frac{3}{4}$ in., roundish or ovoid, mostly conical, with a bent-beak, which is hardly perceptible in most flowers. Fruit smooth, of orange or brick-red colour when ripe. Seeds elliptical or nearly globose, little margined, 6-9, in an orange-coloured pulp, very slightly compressed, pale-brown, adpressed, says Trimen. Wight, on the other hand, says the seeds are white. In the specimens I have examined, the pulp is distinctly whitish, and the older the seeds, the browner their colour [K. R. K.].

Uses:—Ainslie remarks that the Vytians hold it in great estimation, and prescribe it in the later stages of dysentery, and old venereal complaints. It is usually administered in powder, the dose being about one drachm in 24 hours, and continued for eight or ten days together; this quantity produces

one or two loose motions. It is also considered anthelmintic. For external use in chronic rheumatism, it is made into a liniment with cumin seed, onion and castor oil. In the Deccan and in Mysore, the root has a repute as a remedy for snake-bite; it is administered internally, and applied to the bitten part (Dymock and Ph. Ind.).

555. *Zanonia indica*, Linn. H.F.B.I., II. 633.

Sans. :—Chirpota; Dirghapatra; Kuntali; Tiktaka.

Vern. :—Chirpoti (H.); Penar-valli (Mal.); Chiraputi (Mar.); Penar-Valli (Mal.)

Habitat :—Assam and East Bengal; Deccan Peninsula; and Malabar Mountains.

Perennial, climbing herbs. Tendrils simple. Stems stout, cylindrical, semi-woody, grey, glabrous. Leaves large, 3-6in., deciduous, leaving a very prominent circular scar, broadly oval to lanceolate, rounded or cordate at base, somewhat acuminate, apiculate, quite entire, glabrous, rather thick; reticulate venation, rather conspicuous beneath. Flowers greenish-yellow, rather small (female much the larger), on short pedicels. Male panicles 6-12in. long, branched chiefly at base, with flowers in small clusters. Female racemes longer, with flowers solitary, distant. Calyx-segments rotundate, concave, glabrous; petals ovate acuminate obtuse, with incurved points. Male flowers :—filament short, broad, spreading. Female flower :—ovary $\frac{1}{2}$ in., glabrous; styles rather long; capsule 1-1 $\frac{1}{2}$ in. or more, cylindrical, rounded at base, truncate, at apex, glabrous, pale yellowish-brown. Seed with wind as long as the fruit, very flat, glabrous, yellow, wing rounded at the ends (Trimen).

Uses :—The leaves, beaten up with milk and butter, are applied as a liniment in antispasmodic affections (Rheede).

The fruits are said to possess very acrid cathartic properties. Hakims assert that the fresh juice is very efficacious as an antidote to the venomous bites of the gecko (S. Arjun).

The Sinhalese value the plant as a febrifuge (Thwaites).

In Malabar, a bath made by boiling the leaves in water is used to remove the nervous irritation caused by boils (Dymock).

N. O. DATISCACEÆ.

556. *Datisca cannabina*, Linn. H.F.B.I., II. 656.

Vern. :—Akalber (H.); Bhang jala. Bayr Bunja (Pb.); Vof-tangel, Teherg (Cashmere).

Habitat :—Tropical and sub-tropical western Himalaya, from Kashir to Nepal, Simla. Collett says it may occur in the Sutlej or Giri Valley.

A glabrous herb; stem erect, robust, 2-6ft., branches flower-bearing, long. Stem-leaves alternate, pinnate (lower ones the larger), 6-12in.; leaflets 5-11, shortly stalked, lanceolate, 6 by 1½in., coarsely toothed, tip long pointed, entire. Leaves of branches alternate, linear-lanceolate, 1-3in., toothed or entire; stipules none. Flowers 1-sexual, regular, male and female on different plants, yellow, small, shortly-stalked, in numerous axillary clusters. Male flowers:—Calyx-tube vein short, limb 5-lobed; petals none; stamens sessile, anthers oblong, rather large, filaments very short. Female flowers:—Calyx-tube ovoid, obscurely 3-angled, adnate to the ovary, limb 3-toothed; petals none; ovary inferior, 1-celled; styles ¼-3in. each divided nearly to the base in 2 linear stigmas; ovules numerous attached to 3 placentas on the cell-wall. Capsule oblong, ½in. by less than ¼in., opening at the top; seeds numerous, minute (Collett) and (C. B. Clarke).

Parts used :—The herb, roots and bark.

Use :—It is bitter and purgative, and is occasionally used in fevers and in gastric and scrofulous complaints. In Khagan, the bruised root is applied to the head as a sedative. Madden states that under the name, *Bujr Bunja*, it is used medicinally in Kurnool (Stewart).

It may be administered in doses of from 5 to 15 grains in intermittents (Dymock).

Medicinally, it acts as a sedative in rheumatism (Watt).

Used as an expectorant in catarrh; also locally to carious teeth (London Exhib. 1862) The bark also contains a bitter principle like quassia (Watt).

Datiscein is prepared by extracting the bruised roots with dilute alcohol, distilling off the alcohol, extracting the residue with water, treating the aqueous solution with a small quantity of lead acetate (basic?) and concentrating the filtrate, from which datiscein separates on cooling. It is repeatedly recrystallised from boiling water, when the crystals have but a faintly yellow tint. It is very sparingly soluble in ether, and melts at 190° . Air-dried datiscein gave, on analysis, values agreeing with the formula $C_{21} H_{24} O_{11} + 2 H_2O$, and that dried at 130° gave values agreeing with the formula $C_{21} H_{24} O_{11} + H_2O$. Specimens which had been dried at the latter temperature, however, were frequently found to have undergone decomposition.

When datiscein is boiled with dilute sulphuric acid, datiscetin separates from the solution on cooling, and a sugar, which is not glucose, but rhamnose, remains dissolved.

Datiscetin, $C_{15} H_{12} O_6$, crystallises from alcohol in bright yellow needles, melts at 237° (uncorr.) and dissolves in concentrated sulphuric acid, forming a yellow solution, which subsequently exhibits a beautiful blue fluorescence. When datiscetin is fused with potash, salicylic acid is formed. Datiscetin is converted into picric acid on treatment with concentrated nitric acid, and into nitrosalicylic acid (m. p. 226°), on treatment with dilute nitric acid.

—J. Ch. S, 1894 A, I. 142.

N. O. CACTEÆ.

557. *Opuntia dillenii*, Haw., H.F.B.I., II. 657.

Syn.:—*Cactus indicus*, Roxb. 395.

Vern.:—Nág-phanâ (H. and B.); Pheni-mama (B.); Chapal-send (Dec.); Nâga-dali (Tam.); Nâga mulla (Mal.); Zhorhatheylo (Guz.); Phadyâ Nivdung (M.).

Habitat:—A native of South America, quite naturalized, almost a weed in India, in the Konkan, the Dekkan, extending as far north as the Jhelum in the N.-W. Himalaya, "also the Circars, Canara and Madras. "Apparently," says Gamble, Masulipatam was the place where the Cactus was first grown, and the species *O. Dillenii* D. C."

A fleshy, perennial, leafless shrub, persistent, jointed. Stem branching, formed of successive joints, which are more or less obovate, mostly flat 1 ft. long, bearing at first some minute awl-shaped bodies answering to leaves, which soon fall off, and dense woolly hairs, with tufts of numerous barbed bristles and long, sharp spines also in their axils. Flowers bisexual, regular yellow, tinged with red, open in sunshine and for more than

one day, arising from the tufts on the upper edges or sides of the joints. Calyx-tube adnate to the ovary, not prolonged beyond it, lobes numerous on the upper edge and on the hollow receptacle of the Calyx. Petals numerous, widely spreading; stamens numerous, about half the length of the petals. Stigma 3-fid. Fruit fleshy, obovate or pear-shaped, umbilicate at the top, with spine-bearing tubercles near the apex. The joints strike roots, but it is chiefly spread by birds which eat the fruit and drop the seeds (Brandis).

Uses :—The fruit is considered a refrigerant; the leaves mashed up and applied as a poultice are said to allay heat and inflammation (Ainslie). In the Deccan, the baked fruit is given in whooping cough (Lisboa).

In Dacca, the milky juice is given as a purgative in doses of ten drops mixed with a little sugar (Taylor).

A syrup of the fruit appears to increase the secretion of bile when given in teaspoonful doses three or four times a day, and to control spasmodic cough and expectoration (Dymock).

The ripe fruit when eaten has the power of dyeing the urine red (Miller).

Said to be useful in gonorrhœa. The hot leaf applied to boils hastens suppuration; the leaf made into a pulp is applied to the eyes in cases of ophthalmia.

I have used joints warmed up for poultices in guineaworm, abscesses with marked effect (K. R. K.).

According to Leather, the fruit consists of Water, 16.96 per cent; organic matter 60.64, ash 22.40.

A fruit from Nellore, analysed by David Hooper gave the following results :—Carbohydrates 41.89; fibre 32.00; albuminoids 6.25; fat 3.63; Water 5.67; and ash 10.56. (Report Indian Museum Laboratory. 1904-5 p. 30).

N. O. FICOIDEÆ.

558. *Trianthema monogyna*, Linn. H.F.B.I., II. 660.

Syn.:—*T. obcordata*, Roxb. 385.

Sans.:—Punarnaavi.

Vern.:—Sabuni (B.); Nasurjanghi (Dec.); Sharunnay (Tam.); Gheli jehroo (Tel.); Bishkapra (Pb.); Narmah (Sind.); Kháprá (Bomb); Swet, Sabuni; illat sabuni (H.); Muchu-gôni (Kan.).

Habitat:—Throughout Tropical India; low country Ceylon, common.

A prostrate, somewhat succulent herb. Stems rather angular, glabrous or slightly pubescent, much branched. Leaves obliquely opposite, very unequal, the upper one larger $\frac{3}{4}$ -lin., the lower smaller, $\frac{1}{4}$ - $\frac{1}{2}$ in. obovate, tapering to base, rounded, often apiculate at apex; petiole $\frac{1}{4}$ in.; connate, very much dilated and membranous at base, especially of the smaller leaves, which form a deep triangular axillary bunch, containing the solitary sessile flowers. Calyx-segments ovate, acute. Calyx-tube scarious, thin, closely sheathed by the base of the petiole (Trimen). C. B. Clarke says that the Calyx-lobes are obtuse, cuspidate. Stamens 10-20. Ovary truncate, style simple. Capsule small, almost concealed in the stipular branch, about 8-seeded; cap exserted, truncate, carrying away with it 3 seeds. Seeds reniform, black, dull, muriculate (Trimen).

Use:—The root which is bitter and nauseous, is given in powder in combination with ginger as a cathartic; when taken fresh it is somewhat sweet (Ainslie).

559. *T. pentandra*, Linn., H.K..B.I., II. 660.

Vern.:—Bish Kapra; Narma (Sindh and Pb.); Fasarláni (Sind.)

Habitat:—Punjab, Sindh, and the plains of North-West India.

Diffuse, prostrate, branched herbs; papillose or nearly glabrous. Leaves opposite, 1-1 $\frac{1}{2}$ in., oblong or elliptic; petiole $\frac{1}{4}$ in.

Flowers in sessile clusters. Calyx-lobes ovate, often scarious on the margin, coloured within. Bracts scarious. Petals O. Stamens 5, inserted near top of the calyx. Styles 2. Capsule $\frac{1}{2}$ -in.; beak consisting of two lanceolar portions, acute upward (mitriform), separating into two 1-seeded parts, lower portion of the fruit 2-seeded. Seeds dull black, roughly puberulous, the concentric lineation very obscure (C. B. Clarke).

Use:—It is used as an astringent in abdominal diseases, and is also stated to produce abortion (Dr. Stewart).

560. *T. decandra*, Linn. H.F.B.I., II. 661.

Vern.:—Gada-cani (B.); Bhees Khupra (Dec.); Vallay-sharunnay (Tam.); Tella ghalijeroo (Tel.); Jaija soppu (Kan.).

Habitat:—Deccan Peninsula.

Diffuse, prostrate, branched herb, glabrous or papillose. Leaves 1-1 $\frac{1}{2}$ in.; oblong or elliptic; petiole $\frac{1}{8}$ - $\frac{1}{4}$ in. Flowers in nearly sessile clusters. Calyx-lobes ovate, usually obtuse, often scarious on the margins. Bracts scarious. Stamens 10. Petals O. Styles 2. Capsule $\frac{1}{2}$ in.; beak a truncate solid cylinder, not at all or very obscurely mitriform, with two included seeds, indehiscent or finally splitting. Seeds 4; 2 lower, dull black, puberulous, with numerous faint concentric raised lines.

Uses:—The root is aperient, and said to be useful in hepatitis, asthma and suppression of the menses. A decoction of the root-bark is given as an aperient (Ainslie).

The root, ground up with milk and given internally, is said to be a specific in orchitis. The juice of the leaves dropped into the nostrils relieves one-sided headache (Surgeon-Major Thompson, C.I.E., in Watt's Dictionary).

561. *Mollugo hirta*, Thumb., H.F.B.I., II., 662.

Syn.:—Pharnaceum pentagonum, Roxb. 275.

Vern.:—Kothruk (Sind.); Poprang, gandie bootee (Pb.); Zakhmi-haiyat (Pb. Bázar, according to Stewart*).

* Dymock gives Zakhmi-hyat as the Bombay name of *Kalanchoe laciniata*, DC., which see.

Habitat :—Common throughout India.

An annual herb, stellately woolly, sometimes less hairy, rarely glabrous. Stem prostrate, much branched, leafy. Leaves $\frac{1}{2}$ -lin., opposite or whorled, usually obovate, but vary from round to narrow-lanceolate; petiole 0- $\frac{1}{4}$ in. Flowers usually sessile or nearly so; pedicels sometimes $\frac{3}{4}$ in. Sepals $\frac{1}{8}$ - $\frac{1}{4}$ in., elliptic or oblong, acute. Staminodes linear or O. Stamens usually 10 or more, or even 5. Styles 3-5, linear, short. Capsule a little shorter than sepals, oblong. Seeds many, covered with raised tubercular points, the appendage sometimes carrying more than one bristle. This is a very variable weed in tanks, marshes and rice-fields (K. R. K.).

Uses :—In the Punjab, given as a purgative in diseases of the abdomen (Stewart).

The dried plant is prescribed by native practitioners in Sindh for diarrhœa (Murray).

In Puddokota, the juice is administered internally to weak children (Pharmacographia Indica, vol. II., p. 104).

562. *M. Spergula*, Linn., H.F.B.I., II. 662.

Sans. :—Grishma-Sundaraka, Phani-ja.

Vern. :—Jima (H. B.); Toora-elley, Kacchantharai (Tam.); Chayuntârâshiâkoo (Tel.); Jharasi (Mar.); Kaipajira (Mal.); Parpataka (Can.).

Habitat :—Throughout India, except U.P., Panjab or Sindh.

Branched herbs, glabrous or nearly so. Stems diffuse, leafy. Leaves $\frac{1}{2}$ -lin., usually whorled, spathulate, lanceolate, or elliptic. Petiole 0- $\frac{1}{3}$ in. Pedicels $\frac{1}{8}$ - $\frac{1}{2}$ in., oblong, margins often membranous. Stamens 5-10, stigmas 3, minute. Capsule ellipsoid, a little shorter than the sepals. Seeds many, covered with raised tubercular points, the appendage sometimes comprises a second, yet more minute, short subulate bristle.

Uses :—Considered stomachic, aperient and antiseptic. Ainslie (ii., 431), writes that the plant is administered for suppression of the lochia, and when applied warm and moistened with a little castor oil, is reckoned a good application for earache.

He considers that it is justly held in estimation by the native practitioners. In Puddokota, the juice is applied to itch and other skin diseases (Pharmacographia Indica, Vol. II., p. 103).

563 *M. stricta*, Linn. H.F.B.I., II. 663.

Syn. :—*M. triphylla*, Lour. Roxb. 121.

Vern. :—Jul-papra (B.); kharas (Bomb.).

Habitat. :—Very common throughout India.

Branched glabrous herbs. Stems a foot high, leafy; Leaves $\frac{3}{4}$ -1 $\frac{1}{2}$ in., whorled or opposite, varying from lanceolate acute to obovate obtuse, much narrowed at the base; petiole hence obscure. Cymes compound, the branches sometimes racemed. Sepals $\frac{1}{8}$ in.; elliptic or round. Stamens 3-5, filaments dilated. Styles 3, short, linear. Capsule as long as the sepals, globose, many-seeded, the walls thin. Seeds dark, chestnut-coloured, covered with raised tubercular points; embryo curled into three-quarters of a complete circle.

Use. :—Highly esteemed by the Hindus as a bitter vegetable which they eat occasionally on account of its stomachic, aperient and antiseptic properties. An infusion of the plant is given to women to promote the menstrual discharge (Dymock).

The bitter leaves are antiperiodic (Surgeon-Major Stewart, in Watt's Dictionary).

564. *M. Cerviana*, Seringe, H.F.B.I., II. 663.

Vern. :—Ghima sák (Beng.); Pada (Mar.); Parpada gaum (Tam.); Parpataka (Tel.).

Habitat. :—Hotter and drier parts of India, from the Punjab to Ceylon.

An annual marsh, plant, herbaceous, glabrous, much branched. Stems 3-6 in., erect, usually several. Leaves $\frac{1}{2}$ - $\frac{3}{4}$ in., radical leaves tufted, spatulate or obovate; cauline leaves linear-oblong, often 4-8 in a whorl, whence spring umbellately many branches. Peduncles trichotomous or umbellate-cymose. Sepals $\frac{1}{2}$ in., elliptic or round. Stamens 5. Styles very small. Capsule as long as the sepals, globose, many-seeded. Seeds reticulated without, tubercular raised points "pink-chestnut or yellowish, covered with slightly elevated oblong reticulations, bluntly

ridged on the back" (Clarke). Embryo curled, through less than a semicircle.

Uses:—Thwaites states that the plant is used as a medicine in fevers. Dr. Peters in a special note informs us that it has the reputation of promoting the flow of the lochial discharge (Watt).

565. *Gisekia phranaceoides*, Linn. H.F.B.I., II.
664.

Vern.:—Manall kire, nummuelli kirai (Tam.); Esukadanti kura, Isakadāsari kura (Tel.).

Habitat:—The Punjab, U. P., Sind and South Deccan Peninsula.

Diffuse branched, succulent, glabrous, herbs. Stems 8-18 in. Leaves opposite or falsely whorled, fleshy, spatulate, abounding in raphides, $\frac{3}{4}$ -1 $\frac{1}{2}$ in., oblong or elliptic, entire, narrowed at the base. Stipules absent. Petiole absent or $\frac{1}{4}$ in., cymes axillary, dense. Flowers sessile and pedicelled, hermaphrodite or polygamous, small, greenish or purplish. Sepals 5, nearly free, ovate, herbaceous, with membranous margins, $\frac{1}{8}$ in. Petals absent. Stamens 5, hypogynous; filaments dilated below. Carpels usually 5, distinct, covered with papillæ; each carpel as heavy as the sepals in fruit, ends in a short simple style and contains one basal ovule. Seeds blackish, smooth, minutely glandular-punctate. Embryo curved, less than a semicircle.

Use:—The plant has been found to act as a powerful anthelmintic in cases of tænia. The discoverer, Capt. W. H. Lowther (Journ. Agri-Hort. Soc. of India, 1857), directs that the fresh plant, including the leaves, stalks and capsules, be administered in doses of about an ounce ground into a powder and given in the form of a draught with water. The dose is recommended to be repeated three times, at intervals of four days (Ph. Ind.).

N. O. UMBELLIFERÆ.

566. *Hydrocotyle asiatica*, Linn. H.F.B.I., II. 669 ; Roxb. 270.

Sans. :—Manduka parni.

Vern. :—Brahma manduki, Khula khudi (H.); Thulkuri (B.); Vallarei (Tam.); Manduka-brummi, Babassa (Tel.); Codagam (Mal.), Brahmi; Karinga (Bomb.); Vallarai (Dec.); Von-deloga (Kan.); Kutakan, Kodagam (Malay.).

Eng. :—Asiatic Pennywort.

Habitat :—Throughout India. Ceylon, waste grassy places a very common weed, from sea-level to the highest elevations.

Prostrate, perennial herbs. Stems long, prostrate, given off from leaf-axils of a short vertical rootstock, cord like, glabrous, with very long internodes. Leaves $\frac{1}{2}$ -2 $\frac{1}{2}$ in. long, several—from the rootstock, 1-2 from each node of the runners, petiole 3-6 in., erect glabrous, furrowed above; stipules short, adnate to petiole, but forming a sheathing base. Blade orbicular, reniform, entire, crenate or lobulate, horizontal, more or less cupped. 1 $\frac{1}{2}$ -2 in. The rounded basal-lobes often overlapping, glabrous and shining on both sides. Flowers nearly sessile, usually 3 together, at end of short erect pubescent peduncles, 1-3 from the nodes, opposites the leaves; bracts 2, close beneath umbel, ovate, obtuse; Calyx-segments 0; Petals minute, ovate acute (Trimen); obtuse umbricate (C. B. Clarke). Ovary very much compressed, slightly hairy, styles very short, erect. Fruit about $\frac{1}{8}$ in., ovoid, hard; pericarp thickened, mericarps with the primary and secondary ribs, very obscure or vein-like. Flowers dark-pink (Trimen).

Use :—In Sanskrit works, it is described as a useful alterative and tonic in diseases of the skin, nervous system and blood (Dutt).

Ainslie says that an infusion of the leaves with Fenugreek is given to children in bowel complaints and fever. On the Coromandel Coast, the leaves are applied to the parts that have suffered from blows and bruises.

In Bombay, it is a popular remedy for the slight dysenteric derangements of the bowels to which children are subject; 3 to 4 leaves are given with cumin and sugar, and the pounded leaves are applied to the navel. In the Concan, one or two leaves are given every morning to cure stuttering; and the juice is applied (generally as a *lêp* with Cadamba bark, ghi, and black cumin) to skin eruptions supposed to arise from heat of blood-(Dymock).

In Java, according to Horsfield, the leaves are considered diuretic; and on the Malabar Coast, the plant is one of the remedies for leprosy.

Dr. A. Hunter, after trying it in the Madras Leper Hospital, came to the conclusion that it had no claim to consideration as a specific in leprosy, but found it most useful in ameliorating the symptoms and improving the general health.

The leaves are officinal in the Indian Pharmacopœia and described as alterative, tonic and local stimulant, more especially useful in syphilitic skin diseases, both externally and internally. Recent reports from Europe (1885) confirm this statement, and there has been some enquiry for the drug in Bombay which has led to its cultivation on a small scale (Dymock).

In some parts of India, the people are in the habit of taking powder of the dried leaves with milk for improving their memory and as an alterative tonic.

567. *Eryngium cœruleum*, Bieb. H.F.B.I., II. 669.

Arab.—Shakakul-misri (Arab.)

Pers.—Gurs-dusti (Pers.)

Vern.—Dhudhali (H.); Poli; Mittûa; Kandû; Pahari gâjar; Nûrâlam (Pb.)

Habitat: Kashmir.

A spinescent, glabrous, erect, perennial herb. Stem 2-3ft., undivided below, corymbose and often bluish above. Radical leaves 5 by 1½in., petiole 2-6in.; lower cauline often similar, smaller, with shorter petioles, but more often sessile, elliptic acute, undivided, serrae or subspinulose. Upper cauline sessile

palately divided into spinnulose segments. Bracts 5-6, lin., linear, with a few spines on the margins, sometimes short exterior spines alternating with them; bracteoles linear, spinulose, simple, exceeding the flowers; a few (in the outermost row but one) sometimes spinous, subtrifid. Calyx tube densely scaly; teeth lanceolate-subulate, spinescent. Fruit $\frac{1}{8}$ in.

Use:—The root is considered nervine tonic, and aphrodisiac. In Kandahar, the seeds are said to be officinal.

The alkaline salt of the ashes recommended in hæmorrhoids (Honnigberger).

568. *Bupleurum falcatum*, Linn. H.F.B.I., II. 676.

Vern:—Kâli Zewar; Sipil (Pb.)

Habitat:—Himalaya, from Kashmir to Bhotan and Khasia Mountains.

Glabrous herbs. Stem 1-4ft. erect, corymbose upwards. Radical leaves, linear broader upwards, middle cauline linear, acute, narrowed at the base, more or less amplexicaul. Bracts usually 0 in the Indian forms, sometimes a few scarcely $\frac{1}{4}$ in.; bracteoles 4-5, distinctly shorter than the fruiting umbellule, narrowly lanceolate; rays 5-8, $1\frac{1}{2}$ in.; pedicels 5-15, usually distinct. Disk yellow or brownish, not prominent. Carpels narrowly oblong, ridges not prominent; furrows 3-vittate.

Use:—They are reputed to have stimulant properties (Watt).

569. *Apium graveolems*, Linn; H.F.B.I., II. 679.

Vern:—Ajmûd, bori-ajmûd karafs (H.); Chanû, rân dhuni (B.); Bori-ajamoda, or ajmud (Bomb.); Ajwankapute, budiaji waie (Cutch); Bhût-jhata (Pb.).

English name:—Celery.

Habitat:—Base of the north-west Himalaya, and outlying hills in the Punjab.

Annual herbs, glabrous. Biennial, says C. B. Clarke. This is the wild celery. (The garden celery of the European dinner-table is a special cultivation). Stem 1-8ft. erect, branched. Radial leaves pinnate, with large deeply-lobed segments, cauline

3-partite, segments once or twice trifid, coarsely toothed at the apex. Peduncle 0- $\frac{1}{4}$ in., leaf-opposed; rays of the umbel 5-10, $\frac{1}{12}$ - $1\frac{1}{2}$ in., pedicels 6-10, $\frac{1}{4}$ - $\frac{1}{8}$ in. Fruit $\frac{1}{16}$ - $\frac{1}{12}$ in.; ridges narrow, vittæ broad, occupying the whole breadth of the furrows.

Parts used:—Roots and seeds.

Uses:—Not mentioned in the ancient works of Hindoo medicine. The Mahomedan writers describe it as deobstruent and resolvent, and use it internally as a pectoral, and as a tonic and carminative adjunct to purgatives, also as a diuretic, emmenagogue, lithontriptic, and alexipharmic (Dymock).

The officinal root is considered alterative and diuretic, and given in anasarca and colic. The seeds also are given as stimulant and cordial.

As an antispasmodic, they are used in bronchitis, asthma, and to some extent for liver and spleen diseases, and said to be emmenagogue. Hakims consider it injurious in epilepsy (Honigberger).

570. *Carum Carui*, Linn; H.F.B.I., II. 680.

Sans.:—Sushavi.

Vern.:—Siâh jîrâ, zîrâ (H.); Jira (B.); Zira siâh (Pb.); Gûnyûn (Kashmir and Chenab.); Wilâyati-zîrâh (Bom.); Shimai-shombu, Kekku-virai (Tam.); Shimaisapu (Tel.).

Eng.:—Caraway.

Habitat:—Cultivated for its seeds on the plains and hills of India.

An annual, glabrous herb. Stem 1-3 ft. Branches erect or diffuse. Leaves 2-pinnate, finely dissected; ultimate segments of the lower leaves $\frac{1}{8}$ - $\frac{1}{2}$ in.; lanceolate of the upper leaves, $\frac{1}{4}$ -1 in., linear. Bracts 1-3, small, linear, or O, rarely divided, bracteoles small, linear or O. Rays 3-8, $\frac{1}{4}$ -2 in., unequal; pedicels 3-8, $\frac{1}{20}$ - $\frac{1}{2}$ in., unequal. Fruit elliptic-oblong, $\frac{1}{8}$ - $\frac{1}{6}$ in., yellowish-brown, almost viscid. Carpels terete, narrowed upwards, primary ridges thin, but very distinct; vittæ solitary, rather large; carpophore entire, or shortly 2-fid.

Uses:—Mahomedan writers describe the fruits as aromatic, carminative and astringent; from them they prepare an eye-wash which is supposed to strengthen the sight; they are

used as a pectoral, and considered diuretic and anthelmintic. A caraway bath is recommended for painful swelling of the womb, and a poultice for painful and protruding piles. (Dymock).

Used in native practice as lactagogue.

The essential oil distilled from the fruits contains two valuable constituents, *viz.*, *Carvone*, formerly, *Carvol*, and *carvene* or *limonene*, specific gravity varies between 0.907 and 0.915.

571. *C. Bulbocastanum*, Koch, H.F.B.I., II. 681.

Vern. :—Siyâh zira, Kâlâ jirah (H) ; Guni yun (Kashmir) ; umbhu (Ladakh).

Habitat :—Kashmir, Beluchistan, Afghanistan, Lahaul, Chamba, eastward to Garhwal and Kumaon, and westward to Quetta.

Perennial, glabrous herbs. Root tuberous. Stem 6-30 in. ; erect, branched. Leaves 2-3-pinnate, finally dissected ; ultimate segments of all leaves linear, of the lower often $\frac{1}{2}$ -1 in., of the upper leaves very narrow. Bracts 0, or several linear, sometimes divided ; bracteoles 0.8 linear. Rays 6-16, $1\frac{1}{2}$ in. ; pedicels 10-15. $\frac{1}{8}$ - $\frac{1}{4}$ in. ; fruit oblong, not narrowed upwards. $\frac{1}{8}$ - $\frac{1}{6}$ in. ; yellowish-brown, almost viscid ; carpels exactly oblong, hardly widened at the middle, semi-terete, dorsally sub-compressed ; ridges thin, distinct ; vittæ solitary, rather large.

Use :—The seeds are used for similar purposes as those of *C. Carui*.

I found this very useful as a carminative. It is used in Quetta to protect warm clothes and skins against the ravages of insects. B. D. B.

An inquiry instituted by the Reporter on Economic Products in response to a question put by the Indian Chambers of Commerce, resulted in the collection of specimens of *zarah* (*zira*) from the chief towns of India as well as of the fruits (seeds) and plants from all known areas of supply. The fruits in every instance were found to be *C. Bulbocastanum* and not *C. Carui* (except when stated to be a foreign or imported drug). The examination showed, however, that other seeds are often used as adulterants or substitutes for black caraway. The adulterants were similar in shape, size and markings, but quite destitute of the characteristic aroma. For example, Mr. L. G. Smith, Forest Divisional Officer of Sambulpur, sent four samples from the local bazars which were subsequently identified as (1) the true Caraway (*mita*

zarah), most probably imported; (2) *C. Bulbocastanum*, *sa-* or *shah-zarah*; (3) *Vernonia anthelmintica*, *parbat-zarah*; and (4) *Nigella sativa*, *kala-zarah*. The sample of black caraway was, however, not pure. Pure parcels were received from Yasin in Gilgit and from Hazara. From Kullu and Bashahr were furnished two qualities called "*zira*" and "*singhu*." The latter was stated to be an adulterant. "*Zira*" proved to be *C. Bulbocastanum*, and ultimately, through the assistance of Mr. J. H. Lace, then Assistant Inspector-General of Forests, the adulterant was recognised as *Bupleurum falcatum*. Mr. Lace found the people gathering the seeds in Chamba; he secured a sample and corresponding botanical specimen, so that his material became an authentic type with which to compare the adulterants of commercial parcels. It was in consequence found that the *Bupleurum* was identical with the adulterant sent from most parts of India. Mr. Lace says that *Bupleurum* is known locally as *banchak* or *bunkok*, and that before it is mixed with the carum the fruits are coloured with a decoction of walnut bark. It is sold at 9 seers to the rupee, the true article being very much more expensive—say 3 seers to the rupee. Usually 5 seers of *banchak* are mixed with one seer of *zira*. The black caraway and its adulterant are therefore respectively the "*zira*" and "*singhu*" mentioned in the *Pun'ab Forest Administration Reports* from 1894–1900 as obtained from the Kullu forests and sold, the former at Rs. 15 to Rs. 27½ per maund, the latter at Rs. 8. Sir Walter Lawrence says that the seeds of *Daucus Carota* are also used as an adulterant, but this cannot be done to any great extent since carrot-seed is not abundant and is also easily distinguishable from caraway, while the dyed *Bupleurum* can with difficulty be separated. Sir George Watt's *Commercial Products of India*, pp. 283-284.

572. *C. Roxburghianum*, Benth, H.F.B.I., II. 682.

Syn.:—*Apium involucratum*, Roxb. 273. *Ptychotis Roxburghiana*, DC.

Sans.:—Ajmoda.

Vern.:—Ajmûdâ, ajmot (H.); Ajmudâh, ajmudah-ajvân (Dec.); Rândhuni (C. P.); Asham, tâgam, ashamtâ-oman (Tam.); Ajumoda-voman, ashmadâgâ voman, ajumoda vomaru (Tel.); Ajmûd, rândhuni, chanu (B.); Ajmodâ-vovâ, koranza (Mar.); Ajmodâ vomâ (Kan.); Ajmod, bodi-ajamo (Guz.).

Habitat:—Extensively cultivated throughout India.

C. B. Clarke says:—Probably a cultivated form of *C. strictocarpum* which it exactly resembles, except as to the fruit, which is $\frac{1}{2}$ – $\frac{1}{6}$ in., the part used by man, and therefore that which has varied under cultivation. This shows a wide differ-

ence in size, colour, and hairiness in the two forms, but there is a series of connecting links through the variety *hebecarpa*. In *C. Roxburghiana*, the ultimate segments of the lower cauline leaves are narrowly linear-lanceolate; bractioles 4-8 linear-lanceolate, with scarious ciliate margins, fruit more distinctly rigid, sub-pentagonal, the vittæ very minute, petals hairy.

C. B. Clarke describes the general character of *C. stictocarpum* thus:—Glabrous, or minutely hairy. Root fusiform. Stem 1-3 ft. erect, much branched. Leaves 2-pinnate, ultimate segments often 1 by $1\frac{1}{2}$ in., nearly linear: bracteoles $\frac{1}{4}$ in., rays 6-12, $\frac{1}{2}$ -2 in., equal, slender; pedicels 8-20, $\frac{1}{8}$ - $\frac{1}{4}$ in. Ovary minutely pubescent. Fruit $\frac{1}{4}$ - $\frac{1}{8}$ in., ovoid, ultimately shining, yellow, the dots microscopical, ridges faint; carpels semiterete; vittæ solitary, small.

Variety *hebecarpa*:—fruit $1\frac{1}{8}$ - $1\frac{1}{2}$ in., hispidulous, sometimes densely so and fuscous.

Use:—The seeds are useful in hiccup, vomiting, and pain in the bladder. They form an ingredient of carminative and stimulant préparations, and are useful in dyspepsia.

573. *C. copticum*, Benth., H.F.B.I., II. 682.

Syn.:—*Ligusticum Ajowan*, Roxb. 271, *Ptychotis Ajowan* DC.

Sans.:—Yamâni.

Vern.:—Ajowan, ajwâin (H.); Jowân (B.); Ajamo (Guz.); Chohara (Cutch.); Owa (Mar.); Jawind (Kashmir); Aman, oman (Tam.); Omami, omamu (Tel.); Omu, oma (Kan.); Ajwân, owâ (Bom.).

Eng.:—The Bishop's weed.

Habitat:—Cultivated extensively in India, from the Punjab and Bengal to the South Deccan.

An erect annual, 1-3 ft. high, glabrous or minutely pubescent. Leaves rather distant, 2-3-pinnate; ultimate segments $\frac{1}{2}$ 1 in., all linear. Bracts usually many, linear, sometimes divided; bracteoles 3-5, small, linear. Rays of umbel pubescent. Flowers pure white. Fruit $\frac{1}{2}$ in., ovoid, muricate, sub-hispid, carpels dorsally compressed, ridges distinct; vittæ solitary, small. (Duthie).

Uses:—In native practice, they are much valued for their antispasmodic, stimulant, tonic, and carminative properties. They are administered in flatulence, atonic dyspepsia and

diarrhœa, and often recommended for cholera. They are used most frequently in conjunction with assafetida, myrobalsans, and rock salt. A decoction is supposed to check discharges, and it is therefore sometimes prescribed as a lotion, and often constitutes an ingredient in cough mixture. Dr. Bidie is strongly in favour of the extended use of this medicine.

"As a topical remedy, it may be used with advantage, along with astringents, in cases of relaxed sore-throats. For disguising the taste of disagreeable drugs and obviating their tendency to cause nausea and griping, I know of no remedy of equal power."

Omum Water—or distilled water from the seeds—is also sold in the bazaars, and a crystalline essential oil (*Ajwan-ke-phul*). This is chiefly prepared at Oojein and elsewhere in Central India (*Pharm. Ind.*).

By distillation a WATER and an OIL are obtained, the percentage of the latter being about 3—4.

A crystalline substance or stearoptine separates from the oil and forms on the surface during distillation. This is sold as *ajwan-ka-phul* ("flowers of *ajowan*"), and is identical with *thymol*, which is the principal constituent (45 to 55 per cent.) of *ajowan*-oil and for which alone the fruits are distilled in Europe. It is prepared on a fairly extensive scale in Ujjain and other towns of Central India and was first made known to Europe by Dr. Stocks. The price is from Rs. 6 to Rs. 12 per lb. [*Cf. Rept. Cent. Indig. Drugs Comm.*, i., 125.] The value of *thymol* is mainly as an antiseptic, and very large orders have recently been received from Japan. The price in Europe varies with the character of the Indian season; during cholera and plague years it has been high (e.g. 22s. per kilo in 1901), but over-production has tended to keep prices low e.g. 13s. 6d. in 1897, 13s. in 1903). Besides *thymol* certain hydrocarbons called *thymene* are obtained from *ajowan*-oil and used as a soap-perfume. A sample of the fresh plant itself cultivated at Miltitz (Saxony) yielded 0.12 per cent. oil, but the oil had only 1 per cent. of *thymol*. Of 8,641 cwt. of the fruit exported from Bombay in 1903, 8,443 cwt. went to Germany and the rest to America and Egypt. [*Cf. Schimmel & Co., Semi-Ann. Rept.*, Oct.-Nov., 1903, 104; Apr.-May, 1904, 130.] The distilled dried fruit contains 15 to 17 per cent. protein and 25 to 32 per cent. fat, thus making an excellent food for cattle. (*Watt's Commercial Products* p. 285).

574. *Pimpinella Heyneana*, Wall. H.F.B.I., II. 684.

Vern.:—Tirio; Mârcheia (Chutia Nagpur).

Habitat:—Circars; Deccan Peninsula and Ceylon, frequent in the hills. Chittagong; at Burkul. Jaspur; Sitonga.

A 2-4ft. erect, branched herb with leaves nearly glabrous or pilose. Lower cauline leaves 3-partite or twice or thrice 3-partite, ultimate segments of the lower leaves often 1-2 by $\frac{1}{4}$ - $\frac{1}{2}$ in., serrate, of the upper narrower sometimes linear. Bracts 0; rays 6-12, 1-2in., glabrous or nearly so; bracteoles 1-2, $\frac{1}{8}$ in., often 0; pedicels 6-10, $\frac{1}{10}$ - $\frac{1}{8}$ in. Fruit $\frac{1}{8}$ - $\frac{1}{6}$ in.; carpels ellipsoid, almost globose, ridges slender, rarely white and conspicuous; disc obsolete; carpophore 2-fid, sometimes deeply. Fruit didymous broader than long. Seed nearly terete, not concave on the inner face.

Use:—Root is used in fever (J. J. Wood's Plants of Chutia Nagpur, p. 107).

575. *Seseli indicum*, W. and A., H.F.B.I., II. 693.

Syn.:—*Ligusticum diffusum*, Roxb. 271.

Sans.:—Vana yamâni.

Vern.:—Banjowân (B.); Kirminji-ajvân (Mar.).

Habitat:—Plains of India, from the foot of the Siwaliks to Assam and Coromandel; frequent in Central Bengal.

An annual herb, erect or diffuse, 4-12in., often much branched. Leaves all similarly cut, upper with linear segments, lower 2-pinnate, secondary pinnae ovate, lobed, pubescent. Bracts 4-5, $\frac{1}{3}$ in., narrowly lanceolate, caudate, pubescent. Calyx-teeth 0; rays 8-16, $\frac{1}{4}$ -1in., bracteoles like the bracts, but rather smaller; pedicels 8-16, $\frac{1}{8}$ in. Flowers white or pinkish. Fruit sub-globose, ridges thick, often pale yellow, $\frac{1}{12}$ - $\frac{1}{10}$ in., glabrous or hispid, hairs often clubbed or sub-stellate at the apex; carpels $\frac{1}{2}$ terete, vittae distinct; carpophore entire, disk prominent, styles spreading (C. B. Clarke).

Use:—The seed is used as a medicine for cattle. It is also said to be carminative (Watt).

I have found the seeds to act as a good anthelmintic for round worms, and they are also stimulant, carminative, and stomachic.—Dose of simple powder, from 20 grains to a drachm (Moodeen Sheriff).

576. *Fœniculum vulgare*, Gærtn. H.F.B.I., II. 695.

Syn.:—Anethum Panmorium, Roxb. 272.

Sans.:—Madhurikâ.

Vern.:—Bari saunf, Sonp (H.); Mauri (B.); Sohikire (Tam.); Wariaree (Guz.); Bari-shoppha (Bomb.); Bari-shaup (Mar.) jilakurra (Tel.); Badisopu (Kan.).

Habitat:—Commonly cultivated throughout India.

Tall glabrous herbs, sometimes annual. Leaves 2-3-4-pinnate, ultimate segment linear. Bracts 0; bracteoles 0, or few small and linear. Calyx-teeth 0. Petals yellow, emarginate. Fruit not laterally compressed, oblong or ellipsoid; carpels $\frac{1}{2}$ -terete; ridges prominent, subequal; furrows 1-vittate; coriophore 2-partite. Seed somewhat dorsally compressed, inner face slightly concave. (Duthie)

Use:—Used as stimulant, aromatic, and carminative. The root is regarded as purgative, and the leaves diuretic. In Madras, the fruits are used in venereal diseases (Watt).

Fennel fruit yields about 3 per cent. of volatile oil, which consists of anethol or anise camphor and variable proportions of a liquid isomeric with oil of turpentine. The oil is used in Europe in the manufacture of cordials and enters into the composition of fennel water, which is known in India as *muhori-ka-arak* or *arah bāḍian*.

577. *Prangos pabularia*, Lindl., H.F.B.I., II. 695.

Vern.:—Fitur asaliyun (Pb. and Bomb.); Prangos. Komal (Pushtu); Badian Kobi (Pers., according to Aitchison).

Habitat:—Kashmir.

Tall, perennial herbs. Stem 4-5 ft. Leaves 12-18 in., 3-4 pinnate, very compound. Umbels 6-18 in. diam., sometimes very compound. Bracts 4-8, $\frac{3}{4}$ in., linear. Calyx teeth 0. Petals emarginate, yellow. Pedicels 15-25, $\frac{1}{2}$ - $\frac{1}{3}$ in., whereof 4-8 may produce fruit. Fruit $\frac{1}{4}$ - $\frac{3}{4}$ in.; oblong, commissure broad; wings $\frac{1}{8}$ in. broad; style bases depressed; styles short, early reflexed. Carpels $\frac{1}{2}$ -terete, dorsally compressed, inner face nearly plane, but the epicarp there thin, introflexed in a deep T-shaped groove; epicarp spongy; primary ridges large, sub-equal or the lateral larger; vittæ small, numerous; carpophore 2-partite. Seed $\frac{1}{12}$ - $\frac{1}{10}$ in. diam. dorsally compressed, inner face slightly concave, with a deep narrow T-shaped groove. (C. B. Clarke).

Use:—The fruit or seed is said to be stomachic. The roots are a valuable remedy in the cure of itch (Murray). In Kashmir, the fruit is used in decoction to cure the rot in sheep. The plant is considered heating. In Bombay, the hakims use the fruit as stimulant and carminative. It is said to promote expulsion of the foetus (Dymock). It also possesses diuretic properties (Lindley).

The roots are used as diuretic and emmenagogue by some hakims (Dr. Emerson).

578. *Angelica glauca*, Edgw. H.F.B.I., II. 706.

Habitat:—From Kashmir to Simla; also in the Dhaula Dhar Range, above the Kangra Valley.

Vern.:—Chora or Churâ (Pb.).

Herbs usually tall, glabrous, 4-12ft. Leaves 1-2-3-pinnate, pinnae toothed, usually large. Bracts several, lin., linear; bracteoles many, $\frac{1}{4}$ in. Umbels compound, rays often 20-30, 1-3in.; equal; pedicels hardly half as long as the fruit. Calyx-teeth obsolete; petals obovate, emarginate, white or lurid-purple. Fruit $\frac{1}{2}$ by $\frac{1}{4}$ in., sub-quadrate; dorsal and intermediate ridges approximate, rounded, somewhat corky; furrows 1-vittate; commissure 2-4 vittate; carpels plane on the inner face. Seed less than $\frac{1}{16}$ in. wide, but about twice as wide as thick, almost grooved on the inner face.

Use:—Not used in native practice; but formerly used in Europe, and especially in France, as a cordial and stimulant remedy, in the cure of flatulence and dyspepsia. Also used in obstinate constipation, and in bilious complaints.

579. *Ferula narthex*, Boiss, H.F.B.I., II. 707.

Syn.:—Narthex Asafoetida, *Falc.* F. Asafoetida, Linn.

Vern.:—Hing (Beng. and Hind.); Hiltit (Arab.); Angoza (Pers.); Hingu (Sans.); Anghuzeh-i-lari (Pers.); Perungyam (Tam.); Inguva (Tel.); Hinga (Bom.)

Habitat:—Kashmir.

Perennial herbs. Stems 5-8ft. Leaves pubescent, at least

when young ; 2-4-pinnate, secondary and tertiary pinnae decurrent, entire or very irregularly crenate-serrate. Lower leaves 1-2ft., ovate ; cauline sheaths large from which spring simple or scarcely compound umbels. Terminal umbel large, compound, leafless. Vittæ broad, usually occupying the whole of the furrow, and as long as the carpel, commisural usually 4, 2 slender, sometimes added. Fruit $\frac{1}{4}$ by $\frac{1}{2}$ in. Ovary glabrous.

Use :—The gum-resin is a powerful antispasmodic, expectorant and anthelmintic, a nervine stimulant and a feeble laxative. It is useful in hysteria and hysterical affections, also in spasmodic affections, such as asthma, whooping cough, angina pectoris, flatulent colic, &c. It produces remarkable effects in the advanced stages of pneumonia and bronchitis in children. (Pharm. Ind.) The leaves possess sudorific and carminative properties.

The gum-resin is used as a condiment by natives. It is very efficacious in flatulent colic. In ringworm, it is applied as a paste.

580. *F. Jäschkeana*, *Vatke*. H.F.B.I., II. 708.

Syn. :—*F. foetidissima*, *Regel.* and *Schmalh.*

Habitat :—Kashmir.

Uses :—Yields a gum-resin which, Aitchison says, is applied to wounds and bruises by the inhabitants of Kurram Valley (Watt).

"The careful revision by Mr. E. M. Holmes of the group of plants capable of yielding assafoetida has shown that, although we have as yet actual evidence of the production of assafoetida from *Ferula foetida*, *Regel.* and *F. allicea*, *Boiss.* only, yet there are several other species which probably furnish a portion of commercial gum-resin. In the course of his inquiries, he has been able to point out that the appearance of *F. Narthex*, as grown at Kew, is, when in fruit, different from the figure given in "Medicinal Plants;" that *Ferula foetidissima*, *Regel.*, is not identical with *F. Jäschkeana*, as stated in the 'Flora of British India ; and, lastly, that *F. rubricaulis* can no longer be considered to be a source of galbanum, since it has

an alliaceous taste, which galbanum does not possess. He suggests that it may possibly afford sagapenum." Ph. J. Jan. 5, 1889, p. 534.

When discussing the *hing* and *hingra*, it seems probable that it would be more correct to assign these to groups of species rather than to say that they were each the product of one species. Indeed it would appear that the part of the plant from whence procured, the season of the year when collected, the methods, preparation and degrees and materials of adulteration, exercise considerable influence on the quality and flavour of the resulting drugs. It is, however, convenient to group the commercial resinous products of *Ferula* under three chief species:—1. *F. alliacea*, Boiss, 2. *F. foetida*, Regel, 3. *F. galbaniflua*, Boiss and Buhse.

F. alliacea, Boiss. *Hing*. This might be spoken of as the edible form. The GUM-RESIN is obtained by wounding the upper part of the root, from which a small quantity of a fine gum escapes and is collected. The living root is then sliced daily, or every two or three days, with the exudation adhering to it, till exhausted. The whole mass, consisting of alternate layers of root and gum-resin, is then packed in a skin. As found in the market, the resin consists of a blackish-brown, brittle mass of extremely fetid odour, unadulterated with earth or gypsum, but always with slices of the root. In Bombay it is sometimes adulterated by the addition of gum-arabic, and the cheaper sorts contain an undue proportion of root. Adulteration with sliced potato also takes place.

The resinous mass contains an abundant essential oil which differs from that of *hingra* in having a reddish hue, a higher specific gravity, and a stronger rotatory power. An alcoholic tincture is not precipitated by acetate of lead, nor is the sulphuric-acid solution fluorescent.

F. foetida, Regel. Maynard and Prain, on the Botany of Baluch-Afghan Boundary Commission of 1896 (*Rec. Bot. Surv. Ind.*, i., 130—1), furnish interesting details of the collections of the commercial article on the hills between Samuli and Robat. Asafetida, they observe, affects bare rocky hillsides. It is the plant, or at least one of the plants, that people from Kandahar yearly visit the Koh-i-Sultan to collect. Sir Arthur H. McMahon described the collection of the gum from personal observation. The heads are cut down to within one or two inches of the ground. The cut ends are then covered with a little dry earth in order, the collectors say, to keep the wind off. After twenty hours the people collect what has exuded and cut the stalk down another eighth of an inch. But the milk is not allowed to dry in the sun; to obviate this the collectors build small stone traps, open at one side, over each plant, in order to keep off the sun's rays. The juice when partly dried is mixed with some kind of earth, like fuller's-earth; this is merely to increase the weight, and not with any idea of improving the quality. Doubtless the precautions taken to prevent drying are mainly with a view to facilitate this subsequent adulteration.

Asafetida consists of resin, gum and essential oil in varying proportions, but the resin generally amounts to more than one-half. It is partly soluble

in ether or chloroform. The oil may be separated by distillation. It is light-yellow, with a pungent odour, and if exposed to the air evolves sulphuretted hydrogen. An alcoholic tincture of the drug is precipitated by acetate of lead, and a solution in sulphuric acid is fluorescent. (Watt's Commercial Products p. p. 534-535.)

581. *Peucedanum graveolens*, Benth., H.F.B.I.,
II. 709.

Syn. :—Anetheum sowa, Roxb. 272.

Sans. :—Misreya.

Vern. :—Sowa, Soya (H.); Suva, Shopha, Shepoo, Shewpā (Mar., Bomb) Shoyikirai-virai, Shatakuppi-virai (Tam.); Sompā (Tel.); Sayi (Dec.); Soolpha (B.)

Habitat. :—Throughout tropical and subtropical India.

A perennial, glabrous herb, 1-3 ft. Leaves 2-3-pinnate, ultimate segments of the leaves $\frac{1}{2}$ -lin., linear. Pedicels many, $\frac{1}{2}$ in. Bracts and bracteoles absent. Petals yellow. Styles small. Fruit $\frac{1}{8}$ by $\frac{1}{2}$ in., narrowly winged, plano-convex, 2-3 times as broad as thick. Dorsal and intermediate ridges distinct, slender; vittæ large, solitary in each furrow, 2 on the commissure.

Parts used. :—The leaves and fruit.

Use. :—Mahomedan writers describe it as resolvent, and deobstruent, carminative, diuretic and emmenagogue. It is used as a condiment and medicine. An infusion of it is given as a cordial drink to women after confinement. The leaves moistened with oil are used as a stimulating poultice or suppurative (Dymock).

The fruit yields on distillation with water 3 to 4 per cent. of an essential oil.

582. *P. grande*, Clarke H.F.B.I., II. 710.

Vern. :—Bāphali (Bomb.); Dūkū (H.)

Habitat. :—Bombay Ghauts.

A glabrous, annual herb 3 ft. Leaves mostly radical, long-petioled, amplexical at base, 2-pinnate, leaflets with 3 large, rounded lobes, and to be twice as large as the lateral ones. Lobes 3, large, rounded, 3-4 in., serrate. Bracts oblong or obovate, obtuse, prominent. Fruit $\frac{1}{8}$ - $\frac{1}{2}$ in., obovate, obtuse. Rays 20,

2-3 in., stout; bracteoles oblong, obtuse. Pedicels 10-11, $\frac{1}{2}$ - $\frac{2}{3}$ in. Petals yellow or whitish-yellow. Ovary glabrous. Fruit narrowed to the base, and not there emarginate, nearly as broad as long, $\frac{1}{4}$ - $\frac{2}{3}$ in. long; Dorsal and intermediate ridges triangular, small, obtuse, lateral narrowly winged; dorsal furrows 1-vittate, lateral 2-1-vittate. Vittæ nearly as long as the fruit or the abbreviated, commissural 4 abbreviated. Seed much broader than thick.

The specimens examined for the plate, figured in this work, is drawn for the first time by me for this work from nature, after examining hundreds of plants from the Matheran Hill, in the Colaba District, and supplied by the Hospital Assistant Surgeon in charge, Matheran Dispensary (K. R. Kirtikar).

Use:—It was considered by the ancients as carminative, stimulant and tonic (Watt).

The fruit is used in curries in Bombay as a flavouring agent, but some consider it mawkish. K. R. K.

583. *Coriandrum sativum*, Linn, H.F.B.I., II. 717; Roxb. 272.

Sans:—Dhanyaka.

Vern.:—Dhania (H. and B.); Kotamalli (Tam.); Dhan yabu (Tel.); Kothmir, Dhanû (Bomb.); Dhanû (Sind.); Kotambari, haviya (Kan.).

Habitat:—Cultivated throughout India.

An annual herb, branched, glabrous. Leaves decompose; ultimate segment of the lower leaves ovate or lanceolate, of the upper linear. Umbels compound, rays few; bracts 0, or small, linear; bracteoles few, filiform. Calyx-teeth small, acute, often unequal. Petals obovate, emarginate, white or purplish, of the outer flowers unequal, often radiant. Fruit sub-globose; ridges not prominent, dorsal primary and adjacent secondary strongest, lateral primary, and secondary obscure; vittæ obscure, solitary, under the secondary ridges; carpels slightly concave on the inner face, commissure distinctly 2-vittate; carpophore 2-partite. Seed convexo-concave, about thrice as broad as thick.

Use :—Mahomedan writers describe them as sedative, pectoral and carminative ; they prepare an eyewash from them which is supposed to prevent small-pox from destroying the sight, and to be useful in chronic conjunctivitis. It is also thought to lessen the intoxicating effects of spirituous preparations, and, with barley meal, to form a useful poultice for indolent swellings (Dymock).

In native practice, is used as a carminative, refrigerant, diuretic, tonic and aphrodisiac. The dried fruit and the volatile oil are used as an aromatic stimulant in colic. The seeds are chewed to correct foul breath.

It is officinal in both Indian and British Pharmacopoeias.

The juice of the fresh plant is used as an application to erythema caused by the application of marking nut ; the bruised plant is a cooling application in cases of headache (Sakharam Arjun).

584. *Cuminum Cyminum*, Linn, H.F.B.I., II. 718, Roxb. 271.

Sans :—Jiraku.

Vern. :—Zirā (H.); Jirā (B. and Bomb.); Jir (Mar.); Shiragam (Tam.) ; Jiraka (Tel.).

Habitat :—Extensively cultivated in Rajputana and other parts of North India.

A slender, annual herb, glabrous except the fruit. Leaves twice or thrice 3-partite, ultimate segment filiform. Umbels compound, rays few ; bract and bracteoles several, linear, rigid. Calyx-teeth small, subulate, unequal. Petals oblong or obovate, emarginate, white, often unequal. Fruit cylindric, tip narrowed ; primary ridge filiform, distinct ; secondary usually hispidulous ; vittæ large, solitary under each secondary ridge ; coriophore 2-partite or 2-fid. Seed somewhat dorsally compressed, convexo-concave.

"The fruits resemble very much those of the *Carraway*, but they are larger and of a lighter colour, and each half of the fruit has nine ridges instead of five." (Duthie).

Uses :—It is regarded by the Hindus as stomachic, carminative and astringent ; useful in dyspepsia and diarrhoea. It is thought to be very cooling, and on that account forms a part of most prescriptions for gonorrhoea (Dymock).

Like *Kdla zira*, it is also used as a lactagogue.

Sanskrit authors recommend a poultice made of cumin seeds with the addition of honey, salt and clarified butter to be applied externally for scorpion-bites (Dutt).

585. *Daucus Carota*, Linn, H.F.B.I., II. 718, Roxb. 270.

Sans. :—Garjara.

Vern. :—Gâjar (H. and B.) ; Gajjara, Manjal-mullangi (Tam.) ; Pita-kanda (Tel.) ; Mor mûj, Bul mûj, Kâch (Kashmir) ; Zârdak (Pushtu) ; Petaigâgar (Sind).

Habitat :—Kashmir and the Western Himalaya ; cultivated elsewhere in India.

Annual or biennial herbs, hispid. Stem 1-4 (in the Himalaya, often 6ft.) Leaves 2-3-pinnate, pinnatifid segments, narrow-lanceolate. Bracteoles many, 3-fid and simple. Umbels compound, rays usually many ; outer rays connivent in fruit. Calyx-teeth small or obsolete. Petals obovate, emarginate, white, outer often radiant. Fruit elliptic, $\frac{1}{10}$ in. ; bristles on the secondary ridges glistening white, connate at the base only of the primary ridges, small or sessile, sub-glochidiate. Carpophore undivided. Vittæ solitary under the secondary ridges.

Uses :—The seeds are considered to be a nervine tonic. Boiled with honey and fermented, they produce a spirituous liquor. A decoction of the leaves and seeds is said to be used by natives as a stimulant to the uterus during parturition. The roots are made into a marmalade and considered refrigerant (Emerson.)

In the Punjab, the seeds are considered aphrodisiac, and given in uterine pain (Stewart).

In the Concan, a poultice of carrots and salt is used in tetter, and the seeds are eaten as an aphrodisiac (Dymock).

Its fruits are recommended in chronic diarrhœa (Balfour).

A decoction of carrot is a popular remedy for jaundice in Europe. Rased carrot is applied to burns and foul ulcers (Dymock).

Said to possess diuretic properties (Meadows' Prescribers' Companion).

A poultice made of the roots is used to correct the discharge from ill-conditioned sores. The raw rasped root is also deemed useful as a stimulating application, and is made into an ointment with lard. This is much used in burns and scalds to good effect (Watt).

The raw carrot when eaten acts as a mechanical anthelmintic (Watt's Dictionary).

The seed yields by distillation a medicinal oil. [*Cf. Taleef Shereef* (Playfair, transl.), 113] The chemical constituents of the root are crystallisable and uncrystallisable sugar, a little starch, gluten, albumen, volatile oil, vegetable jelly, malic acid, saline matters, lignin and a peculiar crystallisable, ruby-red neutral principle, without odour or taste, called *carotin*. [*Cf. Pharmacog. Ind.*, ii., 136.]

The amounts of fixed oil obtained from the fruits of plants in this order are exhibited in the following table:—

					Oil per cent.
<i>Carum Carui</i> , Linn.	Caraway	...	...	...	14.8
<i>Apium graveolens</i> , Linn.	Celery	...	...	...	16.7
<i>Pimpinella anisum</i> , Linn.	Aniso	...	...	...	10.4
<i>Foeniculum vulgare</i> , Mill.	Fennel	...	...	...	9.9
<i>Anethum graveolens</i> , Linn.	Dill	...	...	...	17.2
<i>Daucus Carota</i> , Linn.	Carrot	...	...	...	13.1
<i>Cuminum Cyminum</i> , Linn.	Cumin	...	...	...	9.9
<i>Coriandrum sativum</i> , Linn.	Coriander	...	...	...	18.8
<i>Carum copticum</i> , Benth.	Ajowan	...	...	...	22.8

These were greenish or greenish-brown oils having the characteristic odours of the seeds. C. Grimme (*Pharm. Centralb.*, 1911, 52, 661-667).

N. O. ARALIACEÆ.

586. *Aralia Pseudo-ginseng*, Benth, H.F.B.I.,
II. 721.

Habitat:—Nepal, Sikkim, and Bhotan. Khasia Mts.

"Doubtfully separable from the true Ginseng of Japan" (Fl. Br. I., p. 721).

Herbs 1-2ft., with a whole of digitate leaves at its apex. Root-stock horizontal, tuberous or tuberiterous. Stem 6-15 in., erect smooth; the scale at base deciduous, or persistent. Leaflets lanceolate, with scattered bristles, especially on the upper surface, 5, rarely 3, 2-6 by $\frac{1}{2}$ -1 $\frac{1}{4}$ in., acuminate, often caudate, rounded or tapering at the base, closely serrate or deeply double serrate, glabrous, except the scattered bristles. Petiole 1-6 in., glabrous. Petiolules 0-1 in. Peduncles shorter or longer than the leaves, glabrous or nearly so, solitary or 2-4, simple or with 2-5 umbellate heads; pedicels $\frac{1}{4}$ -1 in., pubescent or puberulous; bracteoles $\frac{1}{4}$ in., narrow lanceolate-linear.

Flowers polygamo-monocious; styles 2-3, in the male sometimes united nearly to their summit. Fruit red or half black, half-red, shining, globose, sub-didymous.

Use:—Ginseng enjoys in its native country the reputation of a panacea, and especially of being aphrodisiac. The affections, for the cure of which it is most esteemed, are such as are usually treated by aromatic stimulants, including dyspepsia, vomiting, and nervous affections. It is used as a masticatory and also in infusion, and is occasionally brought to India by the Chinese.

587. *Hedera Helix*, Linn., H.F.B.I., II. 739.

Vern.:—*Dādela* (Nepal); Lablab (Behar); Halbambar, arbambal (Jhelum); Kurol (Chenab); Kuri, Karur (Ravi); Brûmbrûm dakâri (Beas); Karburu (Sutlej) Pb.

Habitat:—Himalayas; Khasia Hills.

A glabrous, large, evergreen, woody climber, adhering to trees, rocks or walls by means of numerous extra-axillary fine rootlets. Leaves simple, leathery, 3-4 in., dark-green and shining above, varying from linear-lanceolate to cordate-ovate, entire or variously-lobed, palmate or sub-pinnatifid; base cordate, rounded or cuneate; petiole $\frac{1}{2}$ -1 $\frac{1}{4}$ in., slender. Flowers polygamous, yellowish green, in pedunculate globose umbels, which again are arranged in sub-corymbose panicles; peduncles 1-2 in., pedicels 5-8 in. long, both clothed with stellate scales.

Calyx 5-toothed or nearly entire. Petals 5, valvate. Stamens 5. Ovary 5-celled; style connate in a short column. Fruit 25-3 in. diam., globose, yellow, turning black when fully ripe, shining; seeds 3-4 ovoid (Kanjilal.)

Wood light-grey or yellow, soft and porous. Annual rings distinct. Flowers—October, April, February, Jan.-June.

Uses:—Dry leaves are used to stimulate sores; and the berries to purge (Irvine).

N. O. CORNACEÆ.

588. *Alangium Lamarekii*, Thwaites. H.F.B.I., II. 746.

Syn.:—*A. hexapetalum*, Lamk. Roxb. 404.

Sans.:—Ankota.

Vern.:—Akola, thaila ankûl (Hind. and Dec.); Ankola, kalâ-akolâ (Bom.); Akar-kanta, baghankara (Beng.) Alangi, azhinji (Tam.); Amkolam-chettu (Tel.); Ankola (Gond.); Dhalâkura (Beng.); (in U. C. Dutt's Mat. Med.) Anisarulimara, eopoata (Can.); Onkla (Guz.); Dela (Santal); Ankol (Kol.); Ankula, dolanku (Uriya).

Habitat:—Sub-Himalayan tract, from the Ganges eastward to Oudh, Bengal, Central and South India.

This is a very handsome tree, and grows very well in the Concan. Whether in foliage, flower or fruit, in whatever condition or season it is seen, it is a striking plant. It is beautifully green-leaved throughout the year. Gamble, however, says "it is a deciduous small tree, shrub or straggler." Brandis says "a shrub or small tree." "Bark $\frac{1}{2}$ in. thick, grey, when young orange-yellow, fibrous. Wood hard, close and even-grained, sapwood light yellow, heartwood olive-brown with a pleasant scent" (Gamble). From all accounts it appears to be a very variable plant. My description is mainly drawn from a large tree growing with a girth of 9 feet in the Military Hospital, Thana (1881-1897), and in the adjacent Mahomedan grave-yard where the main trunks of several trees constantly sent out "suckers." The tree in the Military Hospital compound had nearly half a dozen distinct trees developed from such

suckers, within an area of 20ft. around (See Vol. X.p. 260, Journal Bombay Nat. Hist. Society, Part 11, March 1896. K. R. Kirtikar's Poisonous Plants of Bombay). Branchlets generally spinescent. Leaves membranous, varying exceedingly in shape, from oblong to elliptic-obovate, from obtuse to acuminate, blade 3-6 in.; petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. long, pubescent on the under surface when full-grown. Flowers very fragrant, white, solitary or fasciculate, pedicels and Calyx hairy, petals lin. long, 5-10, usually 6, hairy outside. Fruit a berry $\frac{2}{3}$ in. long, with a beautiful crimson (not-black) tough epicarp, a pulpy mucilaginous mesocarp and a bony endocarp. Seed oblong, solitary, pendulous. Cotyledons large, flat, with three basal nerves, in copious albumen which it is not ruminated (Brandis).

Uses:—The root is described by Sanskrit writers as heating, pungent and acrid. It is laxative and useful in worms, colic, inflammations and poisonous bites. The fruit is said to be cooling, tonic, nutritive, useful in burning of the body, consumption, and in hæmorrhage (U. C. Dutt). It has also a reputation in leprosy.

In native practice, the root-bark is used as anthelmintic and purgative. In Bombay, the leaves are used as a poultice to relieve rheumatic pains (S. Arjun).

Dr. Moodeen Sheriff, in his most valuable Supplement to the Pharmacopœia Indica says: "It has proved itself an efficient and safe emetic in doses of fifty grains; in smaller doses it is nauseant and febrifuge. The bark is very bitter, and its repute in skin diseases is not without foundation."

In a further report upon this drug, he states: "It is a good substitute for Ipecacuanha, and proves useful in all diseases in which the latter is indicated, except dysentery. As a diaphoretic and antipyretic, it has been found useful in relieving pyrexia. Doses as a nauseant, diuretic and febrifuge: 6 to 10 grains of the root bark; as an alterative: 2 to 5 grains; it is given in leprosy and syphilis; the natives consider it to be alexiteric, especially in cases of bites from rabid animals,"

N. O. CAPRIFOLIACEÆ.

589. *Sambucus ebulus*, Linn., H.F.B.I., III 2.

Vern. :—Richh kas ; Mushkiâra ; ganhûla gânda ; gwândish ; Siske tâsar (Pb).

Habitat :—Kashmir and Western Himalaya.

A gregarious, herbaceous plant. Stems mostly simple, 3-6ft. high. Leaves unequally pinnate, 9in. Leaflets 5-9, oblong-lanceolate, free, 3-6in., puberulous, or nearly glabrous. Stipules often foliaceous, serrate. Corymbs peduncled or leafy at the base, compact and many-rayed. Bracteoles minute, linear. Corolla $\frac{1}{2}$ in. diam., broadly campanulate, white, pink, or dark purple. Drupe $\frac{1}{2}$ in. diam., globose, black. C. B. Clarke observes that the flowers, European as well as Indian, have a strong peculiar odour, and that the uppermost flowers are barren.

Use :—The roots have purgative properties, and are used in dropsy, as also the berries (Honigberger).

In England, the berries, and also decoction made of the root and bark of this plant, are very old village medicines, and are in occasional use in country places. They are violently emetic.

An infusion of the fresh or dried flowers is used for cold.

A preparation made from leaves and flowers is an old country medicine for rheumatism.

An oil, obtained by distilling the leaves with steam, is of a dark-brown colour, and has an unpleasant odour, : Sp. Gr. 0.8998 at 15° C.; acid value, 250.90; ester value, 46.0. The saponified oil has a pleasant odour, resembling that of apricots and peaches, and contains an alcohol which has not been identified. Palmitic acid was detected in the oil. (H. Haencel in Chem. Zentr. 1910, abstracted in J. Ch. I. for May 31, 1910, p. 649).

590. *Viburnum fœtidum*, Wall. H.F.B.I., III. 4.

Vern. :—Nara Vela (M.)

Habitat :—Khasia Mountains and Assam.

An erect shrub, 6-10 ft.; branchlets, petioles and inflorescence, stellate hairy. Leaves coriaceous, rhomboid, lanceolate

or oblong-rhomboid, glabrous above, 2 by $1\frac{1}{2}$ in., scarcely acuminate; with the base cuneate or rounded, 3-nerved; margins remotely toothed; axils of the primary nerves, with tufts of hair; secondary nerves, 3 or 4 pairs, transverse, conspicuous beneath. Petiole $\frac{1}{3}$ – $\frac{1}{2}$ in. long. Corymbs terminal, subumbellate, stellate, pubescent, 2–4 in. diam. 4–8-rayed, peduncled; bracts and bracteoles numerous, hairy, from linear-oblong to spatulate-oblong. Calyx-tube glabrous. Calyx-teeth minute, triangular. Corolla lobes $\frac{1}{8}$ in. diam., round, white. Drupe $\frac{1}{2}$ by $\frac{1}{4}$ in., compressed, subacute, red. Seed dorsally 2-grooved, ventrally 3-grooved, and hardly concave.

Use:—It is acrid, bitter and astringent, and used as an emmenagogue. (S. Arjun.)

“It is customary for Hindoo women, who have been confined to hang a branch over the room in which they lie, as a protection against evil spirits and post-partum hæmorrhage.”

Another superstition is, that if seven pieces of the stem of this plant are knotted into a thread made from cotton picked by a virgin, the necklace thus formed will cure scrofulous glands. A cake made from the flour of eighteen kinds of grain with *narvel* juice, is scraped on one side while hot, well moistened with the juice and applied to the head in headache. A wine-glassful of the juice of the leaves is administered internally in menorrhagia daily, also in post-partum hæmorrhage. It is remarkable that *V. primifolium*, an American plant, has also been found useful in all uterine diseases characterised by loss of blood and in threatened abortion (Dymock).

591. *Lonicera glauca*, H. F. and T. III. II.

Vern.:—Shingtik; Shea; Shewa (Pb. and Hindi).

Habitat:—Temperate N.-W. Himalaya; Nubra, Zaskar and Piti. Titail in Kashmir; Garwhal and Kumaon.

An erect, glaucous, densely-branched, wiry undershrub, glabrous except as to the margins of the leaves. Leaves $\frac{2}{3}$ by $\frac{1}{4}$ in., obtuse, oblong, base hardly rounded. Petioles $\frac{1}{2}$ in. Bracts large, ovate, flat $\frac{1}{4}$ – $\frac{1}{2}$ in., glaucous, hispidly ciliate on the margins, usually free, or, when the fruits coalesce, sometimes much connate.

Calyx glabrous or nearly so. Calyx-limb deciduous. Corolla-tube $\frac{1}{4}$ - $\frac{1}{2}$ by $\frac{1}{8}$ in. glabrous. Lobes $\frac{1}{2}$ in., elliptic, yellow. Style glabrous. Berry $\frac{1}{4}$ by $\frac{1}{2}$ in., ellipsoid, pairs sometimes confluent into a spherical fruit. (Both confluent and non-confluent berries occur on one branch). C. B. Clarke.

Use :—The seeds are prescribed for horses in colic (Stewart).

N. O. RUBIACEÆ.

592. *Anthocephalus Cadamba*, Miq. H.F.B.I., III.
23.

Synonyms :—*Nauclea Cadamba*, Roxb. 172; *Sarcocephalus Cadamba*, Kurz.

Sans. :—Kadamba; Nipa.

Vern. :—Kadam, kadamb (H.); Kadam (B.); Bol-kadam (Chit-tagong); Sanko (Kól.); Pandúr (Lepcha); Kodum (Mehi); Roghu (Ass.); Kadambo (Uriya); Kadamba, nhyú (Bomb.); Kadam, kadamb, nhiv (Mah.); Kalam, nhio or nhio (Panch Mahals); Kadamb (Guj.); Vellai cadamba (Tam.); Kadamba, rudraksha-kamba (Tel.); Heltega, arsanatega (Mysore); Kaada vailu, kadaga, kadwai (Kan.)

Habitat :—Wild in Northern and Eastern Bengal, Pegu and the Western Coast; cultivated in Northern India.

A large deciduous tree of rapid growth; branches horizontal, rather drooping at the ends. Bark dark-grey with numerous regular longitudinal fissures; the outer bark peeling off in small rectangular scales. Wood white, with a yellowish tinge, soft, even-grained. Leaves coriaceous, shining, glabrous above, pubescent beneath, elliptic-oblong, ovate, or ovate-cordate, acute, 5-9 in. Stipules linear, early caducous. Flower-heads scented at night, simple, 1-2 in. diam., terminal, yellow, or orange-coloured, with white stigmas. Peduncles 1-1 $\frac{1}{2}$ in. long. Corolla glabrous, lobes erect; Calyx-lobes oblong, persistent. Ovaries non-confluent, 4-celled in the upper, 2-celled in the lower, portion. Bracteoles 0. Fruit a fleshy receptacle, as large as a small orange, on which are inserted numerous closely-packed few-seeded capsules. Seeds not winged, minute.

Parts used :—The Bark and Leaves.

Uses:—The bark is used as a febrifuge and tonic.

In the Concan, the fresh juice of the bark is applied to the heads of infants when the fontanelle sinks, and a small quantity mixed with cumin and sugar is given internally. In inflammation of the eyes, the bark juice, with equal quantities of lime juice, opium and alum, is applied round the orbit (Dymock.)

Decoction of the leaves is used as a gargle in cases of aphthæ and stomatitis (A. C. Mukerji, in Watt's Dictionary, I).

593. *Adina cordifolia*, Hook, f. and Bth., H.F.B.I.,
III. 24.

Synonym:—*Nauclea cordifolia*, Willd.; Roxb. 172.

Sans.:—Dhára-kadamba.

Vernacular names:—Haldu, hardu, kadámi, karam (Hind.); Bangka, keli-kadam, pet-puria, da-kóm (Beng.); Hardua, hardú (C. P.); Karám (Nepal); Kúrumba, komba sanko (Kol.); Karám (Santal); Bara kuram (Mal.); Tikkoe (Bahraich and Gonda); Hardu, paspu kurmi (Gond.); Holonda (Uriya); Shangdong (Garó); Roghu, keli kadam (Ass.); Manja kadambe (Tam.); Daduga, bettaganapa, bandarú, dúdagú, puspukandi, paspu kadimi (Tel.); Arsiutega (Mysore); Hedde, yettega-pettega, arsanatéga, yettada, ahuan (Kan.); Hedú (Mah.); Haladhwán (Guz.)

Habitat:—Dry forests, alt. 1—3,000 ft., from Kumaon to Sikkim, and throughout the hilly parts of India to Ceylon.

A large, deciduous tree, its trunk usually buttressed at the base. Bark soft, $\frac{1}{2}$ in. thick, grey, rough. Wood yellow, moderately hard, even-grained, no heartwood. Leaves cordate-orbicular abruptly acuminate, pubescent beneath, blade 4-9 in. diam., petiole pubescent, 3-4 in. Stipules pubescent, $\frac{1}{2}$ - $\frac{3}{4}$ in. long., concealing the uppermost pair of leaf-buds. Peduncles 2-4 in. long, single or 2-3 from one leaf-axil. Flower-heads yellow, $\frac{2}{3}$ -1 in. diam., receptacle and bracteoles hairy. Calyx and Corolla densely pubescent. Calyx-tube 5-angled, lobes linear, deciduous. Corolla downy; stigma clavate. Capsule $\frac{1}{2}$ in., cuneate, downy, cells about 6-seeded.

Uses:—"The small buds, ground with round pepper, are sniffed into the nose in severe headache" (Revd. A. Campbell, Santal Mission, Pachumba). "Roots used as a medicine in Assam" (H. Z. Darrah, Esq., Assam).

The juice is used to kill worms in sores (Dymock).

594. *Nauclea ovalifolia*, Roxb. H.F.B.I., III. 27 ;
ROXB. 173.

The *Fl. Br. Ind.* considers it to be a doubtful species.

"Possibly *Adina sessilifolia*. Don refers it to *Uncaria elliptica*, which is not a Khasian plant.

Vern.:—Shâl (Sylhet).

Habitat:—"A native of the forests of Silhet, where it is called *shâl* by the natives" (Roxb).

A small tree. Leaves oblong, glabrous; rather coriaceous, 6-10 by 3-6 in., glossy above, base cordate, tip rounded. Stipules broadly oblong. Peduncles 1-2 in., very stout 1-3 terminal, solitary 1-headed. Flower-heads 1½ in. diam., villous. Corolla shaggily silky. Stigma clavate, capsule ½ in., cuneate.

Use:—The bark is said to possess bitterness equal to that of *Cinchona*, and is used by the border tribes in the treatment of endemic fevers and bowel complaints (Ph. Ind).

595. *Hymenodictyon excelsum*, Wall. H.F.B.I.,
III. 35.

Syn.:—*Cinchona Excelsa*, Roxb. 178.

Vern.:—Bhulan; Bhalena (H.); Kalakurwah (Bomb.); Bandâri (Dec.); Bartu (Pb.) Bandâru (Tel.); Sagapu (Tam.); Pundaroo, Kâla buchnak (H.); Bodoka, Konoo (Uriya); Sali (Kol.); Bhorkhend (Santal); Bhoursâl (Mar.); Dudiyetta, dudippa, chê-tippa, bûrja, bandâra (Tel.) Bandaray anui (Kan.). Kukurkât, lamkana (Merwara).

Habitat:—Dry hills; base of the Western Himalaya from Garwhal to Nepal; throughout the Deccan and Central India to the Annamallays; and in Chittagong.

A large, deciduous tree, 30-40 ft. Bark of trunk furrowed and rough, that of branches smooth; ½-¾ in. thick, grey,

exfoliating in irregularly shaped, softish scales. Wood white when cut up fresh; if cut up dry, brownish grey, soft. Leaves opposite ovate-elliptic or almost orbicular, abruptly acuminate, finely pubescent on both surfaces, 4-10 by 3-5 in.; membranous, narrowed into a petiole 1-3 in.; nerves 7-10 pair; stipules broad, recurved, usually glandular serrate. Flowers pedicellate, white, fragrant, in dense cylindrical compound; racemes in terminal drooping panicles, with linear or lanceolate bracts, as long as or longer than the flowers (Brandis). Corolla-tube slender, more than 3 times the length of the Calyx-lobes, $\frac{1}{2}$ in. Stamens 5. Filament dilated. Anthers linear. Ovary 2-celled, style long, exserted. Stigma spindle-shaped. Capsules $\frac{3}{4}$ in., on recurved thick pedicels, $\frac{1}{4}$ - $\frac{1}{2}$ in. long, even $\frac{2}{3}$ in., ellipsoid, many-seeded. Seeds flat, lenticular, winged all round the margin, $\frac{1}{8}$ by $\frac{1}{10}$ in. including the wing.

Uses:—The inner bark is bitter and astringent, and is used as a febrifuge. The outer layer of the bark is tasteless. The Pharm. Indica suggests that in all future enquiries into the subject of Indian antiperiodics, this bark should be one of the first to which attention should be directed.

Regarding the constituents of the bark, Messrs. Charles Stanley Gibson and John Lionel Simonsen write in the Journal and Proceedings of the Asiatic Society of Bengal for 1916, pp. 161-162:—

This bark was first subjected to a chemical examination by Broughton in 1870, and subsequently Naylor (Pharm. Journ. 1893, 14, 311, 1884, 15, 195) investigated it much more thoroughly. Broughton showed that it contained a glucoside, aesculin, and that on keeping the bark lost its bitter flavour owing to the hydrolysis of the glucoside with formation of aesculetin (scopoletin). Naylor, on the other hand, succeeded in isolating a crystalline alkaloid to which he gave the name hymenodyctine and the formula $C_{24}H_{40}N_3$ and also an amorphous neutral substance of the formula $C_{22}H_{43}G_{10}$.*

From the results obtained by Naylor it seemed possible to us that the alkaloid might be of therapeutic value and furthermore, since it was one of the few alkaloids which do not contain oxygen, it should be of considerable scientific interest, and we decided, therefore, to attempt its isolation.

We have isolated aesculin and scopoletin, but we have been unable to find any traces of an alkaloid. It would, therefore, appear that Naylor cannot have

* This formula is obviously incorrect, containing as it does an odd number of hydrogen atoms.

examined the bark of the *Hymenodyctyon excelsum*, but must have been dealing with some other bark.

596. *Oldenlandia corymbosa*, Linn. H.F.B.I., III.
64.

Syn. :—*O. biflora*, Lamk., *O. vamosa*, Roxb. 142.

Sans. :—Kshetraparpati; Parpata.

Vern. :—Daman-papar (H.); Khetpapra (B.); Paripât (Mar.); Popato, Kâzuri (Goa).

Habitat :—An abundant weed throughout India, from the Punjab, Southward and Eastward, to Ceylon and Malacca.

A slender herb up to 1 ft. or more high, but often diminutive and straggling. Leaves sessile, 1-2 in. long, linear or linear-lanceolate, erect, or spreading; margins scabrous and often revolute; stipules short, membranous, dentate or bristly. Peduncles axillary, solitary, slender, shorter than the leaves, usually 2-3-flowered; pedicels filiform; bracts. subulate. Calyx-teeth subulate, nearly equalling the tube when in flower. Corolla white, its tube short. Capsule usually broad, didymous or globose or narrowed to the base, not ribbed, the crown not rising above the base of the calyx-teeth.

It is an extremely variable plant, and some of its forms, cannot easily be distinguished from *O. diffusa* (Duthie).

Uses :—By Sanskrit authors it is considered a cooling medicine of importance in the treatment of fevers supposed to be caused by deranged air and bile, that is, remittent fever, with gastric irritability and nervous depression. The entire plant is prescribed in decoction, and is combined with aromatics.

In Goa, it is much used combined with *Adiantum limatum* and *Hydrocotyle asiatica* as an alterative in low forms of fever. In the Concan, the juice is applied in burning of the palms of the hand and soles of the feet from fever; in burning at the pit of the stomach the juice is given internally with a little milk and sugar (dose 1 tola of the juice obtained by pounding the plant with water). The decoction is given in remittent fever, and is also applied to the surface of the body. It is also given internally to cure heat eruptions (Dymock).

It is given, too, in jaundice and supposed diseases of the liver (Watt).

It is also anthelmintic (Surgeon-Major Mukerji, in Watt's Dictionary).

597. *O. umbellata*, Linn. H.F.B.I., III. 66 ; Roxb. 141.

Vern. :—Chirval ; Chirval-ki-lakri (H. and Dec.) ; Surbuli (B) ; Cherivello ; Chiru véru (Tel) ; Sayawer ; Imbûral (Tam.) ; Kalpenyok (Lepcha).

Habitat :—Western Peninsula, from Orissa southwards. Found in the sandy scrub of the Coromandel Coast and largely collected (Gamble).

An annual herb, diffuse, glabrous or scaberulous. Stem woody, much-branched from the base. Stipules with bristles. Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in., spreading or recurved, often fascicled, linear, flat or almost acicular with recurved margins, acute, nerveless. Peduncles in the upper axils stout, 3-many-flowered ; pedicels short. Cymes sometimes sessile or terminal. Calyx-teeth a little shorter than the Corolla-tube, subulate. Capsule didymous, crown low. Seeds numerous, angled, testa smooth.

Uses :—The small, narrow, pale green leaves of this low-growing plant, the native doctors consider as expectorant, and prescribe them accordingly. Of the virtues of the root in poisonous bites, colds and cutaneous disorders, as mentioned in *Miller's Dictionary*, I know nothing. When dried and powdered, the leaves are sometimes mixed with flour and made into cakes, which are eaten by such as suffer from consumptive and asthmatic affections. The dose of the decoction of the leaves is about an ounce twice daily (Anislie).

598. *Ophiorrhiza Mungos*, Linn. H.F.B.I., III. 77 ; Roxb. 235.

Sans. :—Sârpâkshi.

Vern. :—Kiri-purandân (Tam.) ; Sarpâshi-chettu (Tel.) ; Sarathi (H.) ; Gandha nâkuli (B.).

Habitat :—Khasia Mountains and Assam. Mountains of the Western Peninsula.

A suffrutescent herb, erect, glabrous, or stem petiole cymes and leaf-nerves beneath puberulous. Stipules small. Leaves 2.5 by 1-2½ in., very thin, elliptic or elliptic-lanceolate, long-acuminate, narrowed into the petiole. Cymes 1-3 in. diam., flat-topped, glabrous or pubescent. Cyme-branches sub-umbellate, very spreading. Bracts absent. Calyx-teeth very short. Corolla white, glabrous round at the tip, in bud ½ in., mouth not dilated; lobes very short, obtuse, keeled at the back. Capsule ½-⅓ in. diam., pedicelled. Seeds many, minute, angled.

Use :—The root is intensely bitter and may be used as a tonic. Popularly believed to be a remedy against the bites of venomous snakes, mad dogs, &c.

599. *Mussaenda frondosa*, Linn. H.F.B.I., III. 89; Roxb. 187.

Vern. :—Asari (Nepal); Tumberh (Lepcha); Bhûta-kesa, Lâudachûta (Bomb.); Shivardole (Mar.); Bebina (H.); Vellaellay (Tam.).

Habitat :—Tropical Himalaya, from Nepal eastward. Assam, Khasia Mountains, and the Western Peninsula, from the Concan southwards.

A large shrub, tomentose, hirsute or nearly glabrous. Bark grey, smooth, but granular. Wood white, soft, but moderately hard, close and even-grained. Leaves sessile or petioled, elliptic oblong or ovate, acuminate; stipules long or short, often 2-fid. Cymes contracted or open, softly silkily-tomentose; bracts and caducous calyx-lobes elongate-lanceolate, much larger than the ovary, twice the length of the ovary or longer. Corolla orange-yellow, pubescent, silky or hirsute; lobes broadly ovate, acute or acuminate. Berries obovoid, glabrous; areole broad.

Uses :—In the Concan, ½ a tolâ of the root is given with cow's urine in white leprosy.

In jaundice, 2 tolâs of the white leaves are given in milk (Dymock).

600. *Randia uliginosa*, De. H.F.B.I., III. 110.

Syn.:—*Posoqueria Uliginosa*, Roxb. 239.

Vern.:—Pendari (Bomb.); Pindālu, panar, paniah, katul, pindar, bharani (H.); Piralo (B.); Panelra, cindra, telp-hetru, phetra, (Mar.); Wagata (Tam.); Nalaika, devâtāmalle, nallakākasi, gûāku (Tel.); Kare, pendri, pandri (Kan).

Habitat:—Eastern, Central and Southern India; not common northwards, Sikkim and Assam.

A small, armed, rigid, glabrous, deciduous tree. Bark $\frac{1}{4}$ in. thick, reddish-brown, exfoliating in thin flakes. Wood whitish-grey close-grained, hard; no heartwood. Branches quadrangular, usually bearing short, terete, decussate branchlets, with several pair of approximate leaves and above them 2-4 strong, straight, sharp, decussate thorns. Leaves glabrous and shining above, often pubescent beneath, obovate from a cuneate base; blade 3-6 in. long; petiole $\frac{1}{4}$ in. long. Stipules triangular. Flowers solitary, white, dimorphic, either large and sessile, or small and petioled, scented. The large and sessile flowers often have Corolla 2 in. diam., 2 separate stigmas, and the tube longer than the free portion of the Calyx. The small pedicillate flowers have a short Corolla-tube and a clavate stigma marked with spiral lines. Calyx-lobes short. Corolla-tube glabrous outside. Fruit, when ripe, yellow, edible, with a hard pulp, those produced by the large sessile flowers are ellipsoid, 2 in. long, while those of the smaller peduncled flowers are of half that size. Seeds compressed, smooth, closely packed in pulp.

Uses:—The unripe fruit roasted in wood ashes is used as a remedy in diarrhœa and dysentery, the central portion consisting of the stone and seeds being rejected; it is astringent (Dymock). The root, boiled in *ghi*, is sometimes given in similar cases.

601. *R. dumetorum*, Lamk. H.F.B.I., III. 110.

Syn.:—*Posoqueria dumetorum*, P. nutans, P. longispina and P. floribunda, Roxb. 239-241.

Sans.:—Madana.

Vern.:—Mainphal, manyul, karhar, arar (H.); Menphal (B.); Mindla, mandkolla, mindhal, mendphal (Pb.); Gundrow (Mar.); Mindhal (Guz.); Maidal, amuki (Nepal); Panji (Lepcha); Patiree (Uriya); Madu-karray, marukkallân-kay (Tam.); Mangha (Tel.); Kare (Kan.).

Habitat:—Subtropical Himalaya, from Jammu eastwards to Sikkim; and thence southwards to Chittagong, and the Western Peninsula (not recorded from Assam, the Khasia Mountains, Silhet or the Eastern Peninsula).

A deciduous, thorny shrub or small tree, armed with stout axillary spines, 1-1½ in. or 1-2 in. long. Bark grey. Wood white or light-brown, compact, hard, close and even-grained. Branches horizontal, rigid, many of the lateral ones suppressed, and very short spines in opposite pair coming off immediately above branchlets, horizontal, woody, strong, very sharp. Leaves usually fasciculate on the suppressed branchlets, nearly sessile, 1-2 in. long, obovate, oval or spatulate, tapering to base, obtuse, apiculate, glabrous, or slightly pubescent, thin, reticulate veined. Stipules acuminate. Flowers 1 in. diam., 1-3 at ends of suppressed branchlets. Pedicels short. Calyx-limb broadly tubular, from nearly glabrous to very hairy; segments leafy, ovate, acute, imbricate, glabrous, or slightly hairy. Corolla hairy outside; tube as long as the Calyx; lobes rounded, spreading. Fruit globose or broadly ovoid, about ¾ in., crowned with large Calyx-limb, pilose, yellow, 2-celled; pericarp thick. Seeds flat, surrounded with gelatinous pulp: Flowers yellowish-white, yellow, says Brandis.

Parts used:—The bark, rind and fruit.

Uses:—The fruit is described by Sanskrit writers as the best and safest of emetics. One ripe fruit is said to be a sufficient dose; emesis is generally promoted by a drink containing bitters and aromatics.

Mahomedan writers describe it as an emetic which expels bile and phlegm, at the same time acting as an aperient; it should be administered with aromatics and honey (Dymock).

Externally applied, it acts as an anodyne in rheumatism (Stewart).

The bark is given internally and is also applied externally when the bones ache during fever (Revd. A Campbell).

An infusion of the bark is used as a nauseating medicine. It is also applied to bruises, mixed with cowdung.

Dr. Moodeen Sheriff has found the drug a good substitute for Ipecacuanha in dysentery. He recommends the powdered pulp as the most convenient form for administration. Dose: 40 grains as an emetic; 15 to 30 grains in dysentery.

The bark of the tree is astringent. In colic, the fruit is rubbed to paste with rice water and applied over the navel (Dymock).

It is also used to poison fish.

The pulp of the fruit is believed by many native practitioners to have also anthelmintic properties, and is sometimes used as an abortifacient. Ground into a coarse powder and applied thus to the tongue and palate, it is highly esteemed as a domestic remedy for the fevers and incidental ailments which children are subject to, while teething (Murray).

Sir James Sawyer of Dublin has used it "as a nervine calmative and antispasmodic in cases in which the vegetable antispasmodics, such as Valerian and Assafoetida, appear to be indicated."

In addition to the substances described later, a minute quantity of an alkaloid was isolated, but not characterised or identified, and a small amount of lead (0.02 per cent.) was invariably present.

Randiasaponin, a glucoside, forms yellowish plates, or a white, amorphous powder, and melts and decomposes at about 250°. It loses 11.4 per cent. of water at 100°; the percentage composition of the dry substance is C, 55.52; H, 8.72; O, 35.76. It is not hygroscopic, but dissolves in water to a neutral solution, which froths readily. It is reprecipitated from this solution by moderately strong hydrochloric or sulphuric acid, and is also thrown down by lead acetate and basic acetate as a gelatinous compound, which serves for its purification. It does not reduce alkaline copper solution, except after prolonged hydrolysis with dilute hydrochloric acid, when it is converted into randiasapogenin and two sugars. The osazone of one of these is insoluble in ether, crystallises in yellow crusts, and melts at 166–167°, whilst that of the other is soluble in ether and amorphous, and melts at 176–177°. Randiasaponin, like quillaysapotoxin, has the property of dissolving red blood corpuscles to a clear solution.

Randiasapogenin, $C_{26}H_{50}O_9$ (?), the product of the hydrolysis of randiasaponin, forms a friable mass, little soluble in water. It decomposes without

melting, the chief product being a substance crystallising in colourless needles. Moist randiasapogenin dissolves in strong sulphuric acid to a yellow solution, which shows a characteristic green fluorescence.

Randic acid, $C_{30}H_{52}O_{10}$, appears to be a monobasic acid of the series $C_nH_{2n-3}O_{10}$, characterised by Kobert as the saponin series, and exists, apparently, in loose combination with randiasaponin. It crystallises from alcohol in white, nodular masses, and melts at $208-210^\circ$. It is sparingly soluble in water and ether, freely in alcohol, acetic acid, and concentrated sulphuric acid; solutions of the alkali salts froth very readily. The potassium salt is insoluble in alcohol. The calcium, barium, ferrous, ferric, copper, lead, mercurous, and mercuric salts are mentioned. Randic acid resembles quillayic acid in dissolving red blood corpuscles without destroying the colouring matter, and in precipitating albumins and peptones. To these properties, and the similar property of randiasaponin, the poisonous character of the fruit is probably due.

Randiatannic acid exists in small quantity in the pericarp, and is a brown, very hygroscopic mass, which is freely soluble in ether, as well as in water and alcohol. It gives a green coloration with ferric chloride, and a yellow precipitate with basic lead acetate, and reduces alkaline copper solution.

One of the products of the decomposition of randiatannic acid appears to be randia-red, $C_{33}H_{34}O_{20}$, a substance to which the brown colour of the pericarp of the fruit is due; this is precipitated by acids from the alkaline extract as a brown powder, which is insoluble in water, alcohol, and ether, but easily soluble in alkalis. The solutions give reddish precipitates with lead acetate and alum. A brownish-red colouring matter, probably the ammonium-derivative, is precipitated by ammonia from the acid mother liquor; it forms a harsh mass resembling asphalt, and is soluble in hot water; it is decomposed by caustic soda with evolution of ammonia.

Randia fat is a yellowish-green substance of the consistence of butter; it melts at $28-29^\circ$, and its sp. gr. is 0.9175 at 20° . The acid number is 13.8; the ester number, 146.4; the saponification number, 160.2; and the iodine number, after two hours, 43.24. (J. Ch. S. 1895 pp. 189-190).

602. *Gardenia lucida*, Roxb. H.F.B.I., III. 115 ;
Roxb. 237.

Vern.:—Dikamali (H. and Guz.); Konda-manga, tetta-manga kuru (C. P.); Karinga (Tel.); Kumbi (Tam.).

Habitat:—Western Peninsula, common from the Concan southwards to Chittagong.

A small deciduous tree. Shoots resinous. Bark $\frac{1}{2}$ in. thick, greenish grey, exfoliating in irregular flakes. Wood yellowish white, close-grained, hard; no heartwood, no annual rings (Gamble). Leaves 3-10 by 2.5 in., elliptic-oblong, narrowed into the short marginate petiole. Secondary nerves 20-25

pair; stipules sheathing, large, broadly ovate, connate. Flowers fragrant, peduncled, white, turning yellow; tube 1-2in., lobes 5, obovate-oblong. Fruit ovoid, crowned with persistent Calyx-limb. Pericarp thick, woody; endocarp thick, woody, nearly 2-celled, with prominent placentas.

Use :—The tree gives a gum resin from wounds in the bark and, from leaf-buds. This is hard, opaque yellow, greenish or brown with strong smell, and is used in cutaneous diseases and to keep off flies and worms (Gamble).

603. *G. gumnifera*, Linn. H.F.B.I., III. 116; Roxb. 238.

Vern. :—Dekamali, kamarri, (Hind.); Baruri, barui (Kol.); Papra, kamarri (C. P.); Chitamatta, chitnityal, gaggaru(Tel.); Chitta, kambia (Kan.); Dikemāli (Bom.).

Habitat :—Chota Nagpore, Western Peninsula from the Satpura range southward. Central and South India; in the Central Provinces, Dekkan, Konkan, Chittagong (Gamble).

A small tree; "a woody bush," says J. D. Hooker. Bark greyish brown, smooth, $\frac{1}{4}$ in. thick. Wood yellowish-white, close-grained, hard. The buds yield a resinous, bright yellow gum, transparent and pleasant to chew, used like the gum-resin yielded by *G. lucida*. Gamble says he has never seen the gum procured from the bark. Leaves $1\frac{1}{2}$ -2 $\frac{1}{2}$ in., coriaceous, cuneate or obovate, shining, sessile or sub-sessile; base acute, obtuse or cordate; sometimes puberulous beneath; nerves 15-20 pair. Stipules connate, truncate or mucronate. Flowers subsessile, white. Calyxlimb shortly tubular, teeth stout, subulate; lobes 5-6. Corolla-tube 1-2in., glabrous or pubescent; limb 1-3in. diam., lobes 5, oblong, obtuse. Fruit 1-1 $\frac{1}{2}$ in., ellipsoid or oblong, with a stout beak, smooth; pericarp thin, woody, endocarp 4-5-valved (Roxburgh), thin, crustaceous, nearly 4-5-celled (Brandis); placentas 4-5.

Uses :—The gum obtained from this plant is used internally in dyspepsia accompanied by flatulence. In veterinary medicine, it is employed to keep off flies from sores (Dymock).

Used by natives as an astringent for cleansing foul ulcers, and for allaying irritation of the gums and checking diarrhœa during teething of children (Murray, 195).

Those who have written upon Indian drugs, say little about this resin, although it is an article of commerce, and can always be obtained in quantity. Recently it has attracted attention in Europe, and has been examined by Stenhouse, Groves and Fluckiger (Dymock).

The drug is considered antispasmodic and carminative, and, when applied externally, antiseptic and stimulating. Said to be a successful anthelmintic in cases of round worm (Watt).

The powdered gum-resin is said to have diaphoretic and expectorant properties, used internally in guinea-worm, dose from 2 to 16 grains (Surgeon Joseph Parker, in Watt's Dictionary).

604. *G. turgida*, Roxb. H.F.B.I., III. 118; Roxb. 439.

Vern. :—Thanella, khûrûr khuriari, ghurga, mhaner (H.); Bamemia, dhobel kirat (Uriya); Karhar, duduri (Kol.); Phurpata (Kurku); Dandu kit, dondonki (Santal); Panjra, pendra (Gond.); Karumba (Raj.); Karhâr; Khemra (C. P.); Khurphendra, pendri, phanda, phetra (Mar.); Phetrak (Bhil.); Manjunda, telel (Tel.); Bongeri (Kan.).

Habitat :—Tropical Himalaya ascending to 4,000 ft., from Kumaon to Bhotan, Oudh, Behar, Chota Nagpore, Bombay, Central and Southern India, also in Burma.

A small-deciduous tree, 25ft. Bark smooth, bluish—grey, $\frac{1}{2}$ in. thick, compact. Wood close-grained, white, with a purplish tinge, no heartwood (Gamble). Branches rigid, robust, armed with strong, axillary, often leaf-bearing, spines. Leaves often crowded at ends of branchlets, 1-4 in. long, obovate, narrowed into short marginate petiole, tomentose or pubescent above, when mature. Flowers white, fragrant. Corolla-tube $\frac{1}{3}$ - $\frac{1}{2}$ in. long. Fertile flowers solitary, sessile. Calyx-lobes oblong, sterile clustered in short pedicels. Calyx-teeth minute, sometimes unequal. Fruit grey,

1-3in., ovoid or globose, smooth; pericarp thick, endocarp woody, shining within. Placentas 2-6.

Use.—A preparation from the root is employed by the Santals as a remedy for indigestion in children (Revd. A Campbell).

605. *G. campanulata*, Roxb. H.F.B.I., III. 118; Roxb. 238.

Vern. :—Hsay-than-paya (Burm.)

Habitat :—Foot of the Sikkim Himalaya; Assam, Sylhet and Chittagong; Behar, and summit of Parasnath.

A large, deciduous shrub or small tree, 15-20ft., armed with long straight sharp spines, $\frac{1}{2}$ -1 $\frac{1}{2}$ in., often leafy or leaf-bearing. Leaves membranous, glabrous, lanceolate; blade 2-4in., or 1 $\frac{1}{2}$ -3in. by $\frac{1}{2}$ -1 $\frac{1}{2}$ in., narrowed into a short petiole; midrib slender, nerves faint. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in. Stipules triangular, caducous. Flowers greenish-white. Calyx of male flower $\frac{1}{3}$ in., ellipsoid or subglobose. Corolla-tube $\frac{1}{3}$ in. long, upper portion campanulate, white. Lobes short, obtuse. Fertile flowers solitary, sessile. Calyx-teeth oblong or spatulate, foliaceous. Sterile flowers fasciculate shortly pedicellate. Fruit $\frac{3}{4}$ -1 $\frac{1}{4}$ in. long, ellipsoid or globose, obscurely 5-ridged; pericarp very thick; endocarp woody. Placentas 5.

Use :—The fruit is used as a cathartic and anthelmintic (Roxb.).

606. *Diplospora sphaerocarpa*, Dalz. H.F.B.I., III. 123.

Habitat :—Western Peninsula, or the Ghats, from Bombay southwards.

An evergreen, small, glabrous tree. Branches terete. Leaves 2-6 by 1 $\frac{1}{2}$ -2 $\frac{1}{2}$ in., elliptic lanceolate, obtuse or acute. Petiole $\frac{1}{4}$ - $\frac{1}{2}$ in.; stipules short, tip not setaceous. Flowers fascicled, shortly pedicelled. Calyx-limb 4-lobed. Calyx-teeth obtuse, ciliate. Corolla-tube very short, (shorter than the Calyx-teeth), throat glabrous, lobes $\frac{1}{4}$ in. Filaments very short. Fruit pedi-

celled, globose, $\frac{2}{3}$ in. diam., "on bracteolate pedicels, $\frac{1}{4}$ in. long," says Brandis. Seeds few, vertically imbricate, much compressed.

Uses:—The berries of this tree are known as "wild coffee." The roasted and powdered seeds were submitted to Brig-Gen. A. Kenney Herbert, a great authority on Indian cookery, and he reported as follows:—The percolated liquor had a remarkably pleasant taste, having a marked flavour of coffee. Indeed, the only difference I could detect was this: the liquor was not so dark in tint as coffee, being more golden-brown than dark brown, and the beverage brewed seemed not quite so strong as would have been produced by a similar quantity of coffee powder. There can be no doubt of the distinct coffee-like properties of this powder, and the absence of any twang or conflicting flavour to mar its pleasant taste (*Pharmacographia Indica*, Vol. II., p. 226).

607. *Canthium didymum*, Roxb. H.F.B.I., III. 132; Roxb. 180.

Syn.:—*Plectornia didymia*, Kurz, *Psydrax dicoccos*, Gaer.

Vern.:—Garbhagojha (Santal); Yerkoli (Tam.); Yellal, porawa-mârâ, galkaranda (Kan.).

Habitat:—Sikkim Himâlaya, and distributed east to the Khâsia and Jayntea Mountains. Also met with in Chutia Nagpur and in the Western Peninsula, from the Concan southwards.

A stout, evergreen, unarmed glabrous shrub, Leaves very variable, 2-6 by $\frac{1}{2}$ -4 in., very coriaceous, polished above, usually obtusely caudate-acuminate, base acute obtuse or even cordate, nerve-axils eglandular; petiole $\frac{1}{8}$ - $\frac{1}{3}$ in. Cymes compressed, subsessile or on a short peduncle, $\frac{1}{4}$ -1 in., sometimes puberulous. Bracts short or 0. Flowers 5-merous. Calyx truncate or obscurely toothed. Corolla campanulate, tube $\frac{1}{6}$ - $\frac{1}{4}$ in.; lobes 5, subacute. Style glabrous; stigma subquadrate, notched or 2-fid. Fruit very variable, $\frac{1}{4}$ - $\frac{1}{2}$ in. globose or ellipsoid or obovoid compressed, subdidymous, putamen rugose. (J. D. Hooker).

Uses :—The bark is used by the Santals in fever (Revd. A. Campbell). Watt, ii. 129.

608. *C. parviflorum*, Lamk, III. 136; Roxb. 176.

Syn. :—*Webera tetrandra*, Willd.

Vern. :—Kirni (Bomb.); Karai-cheddi (Tam.); Tsjêron kâra (Mal.); Bâlsu chettu, bâlsu (Tel.)

Habitat :—Western Peninsula, from the Concan southwards.

A rigid, glabrous shrub; branches stiff, spreading; spines numerous, axillary or subaxillary, straight, stout and sharp. Wood hard, close-grained. Spines 1-2 in. long. Leaves glabrous, crowded on shortened lateral shoots, small, ovate, obovate or orbicular-obtuse, $\frac{1}{2}$ -1 in. long, rather coriaceous, dirty-green when dry, opaque, base cuneate; stipules small, with long cuspidate points; petiole slender, $\frac{1}{10}$ - $\frac{1}{4}$ in. long. Cymes $\frac{1}{4}$ - $\frac{3}{4}$ in. Peduncle and pedicel slender, short or long. Flowers 4-merous, yellowish, in many-flowered peduncled cymes. Calyx-teeth minute. Corolla-tube broad, campanulate, $\frac{1}{10}$ in. long, a little longer than lobes, "subglobose lobes obovate," says J. D. Hooker. Style glabrous, stigma capitate, tuberculate, "globose," says Brandis. Fruit yellow, edible, subquadrate or obcordate subdidymous, $\frac{1}{2}$ in. diam., enclosing 2 hard stones. "Spines sometimes threefold" (Roxburgh).

Use :—A decoction of the edible leaves, as well as the root of this plant, is prescribed in certain stages of flux, and the last is supposed to have anthelmintic qualities, though neither have much sensible taste or smell (Ainslie, Mat. Med. ii. 63).

609. *Vangueria Spinosa*, Roxb. H.F.B.I., III. 136. Roxb. 180.

Sans. :—Pindu, Pinditaka.

Vern. :—Alu (Mar.).

Habitat :—From Northern Bengal to Canara. Common in the Ghâts, in Bombay and throughout the Konkans, Khandesh, Bengal, Tenasserim and Burma.

A small handsome tree, or large bush, thorny. Spines simple

or 3-nate. Leaves glabrous, villous or tomentose, opposite, or 3-nate, whorled, membranous, ovate or obovate-lanceolate, acute or acuminate; blade 2-4 in., petiole $\frac{1}{8}$ -1 in.; stipules cuspidate, from a broad base, very deciduous. Flowers small, greenish, in shortly peduncled cymes, 1-1 $\frac{1}{2}$ in.. Calyx with 5 teeth. Style glabrous; stigma 4-5-lobed. Drupe $\frac{1}{2}$ -1 in. diam.; fleshy, edible, smooth, subglobose or turbinate, with 4 or 5 smooth, broadly hard, 1-seeded stones.

Use :—It is the Pindu and Pinditaka of Sanskrit writers, who consider the fruit to be medicinal, and describe it as strengthening, cooling, and an expellant of phlegm and bile.

The fruit is eaten when ripe, cooked or uncooked, or roasted. Another allied species, *V. edulis*, a native of Madagascar, is cultivated in gardens for its edible fruit.

Contains sugar, gum and a small quantity of tannin, but no cyanogenetic glucoside or alkaloid was found. The dried seeds yield on extraction with ether 14.01 p.c. of a semi-drying oil, with an iodine value of 15.07.—D. Hooper. Annual Report, Indian Museum, Industrial Section, 1909-1910.

610. *Ixora Parviflora*, Vahl. H.F.B.I., III. 142.

Vern. :—Kotāgandhal (Loha janzia, in Chutia Nagpur) (H.); Rangan (B.); Pê-tê (Kol.); Merom met (Santal); Tellu, Kurwan (Uriya); Disti, kori (Gond.); Kurat, lokandi, narkurat, raikura, guāvi-lakri, mākri che-jhār (Bomb.); Kura (Konkan); Shulundu kora (Tam.); Korimi pāla, korivi pāla, putta pāla, karipal, kachipadel, tadda pallu (Tel.); Gorivi, korgi, bennugorvi (Kan.)

Habitat :—Western Bengal, Behar, Western, Central and South India.

A small, evergreen, glabrous tree; cymes sometimes slightly pubescent. Leaves coriaceous, hard, shining, sessile, or shortly pedicellate petiolate, oblong or ovate-oblong, with a rounded or nearly cordate base, 4-5 in. long; the reticulate veins nearly as prominent as the secondary nerves. Flowers white or pink, scented, in ample, nearly sessile, compound trichotomous cymes. Corolla glabrous, tube $\frac{1}{3}$ - $\frac{1}{2}$ in., lobes oblong, filaments short. Style very pubescent; tip of Corolla ellipsoid in bud. Stigma subcapitate, simple or cleft. Fruit small, didymous. Seeds plano-convex.

Use :—The Santals employ the root or fruit as a medicine to be given to females when the urine is high colored (Revd. A Campbell).

611. *I. coccinea*, Linn. H.F.B.I., III. 145. Roxb. 126.

Syn. :—*I. Bandhuca*, Roxb. 126.

Sans. :—Ruktaka; Bandhooka.

Vern. :—Rangan, Rajana (B.); Pankul (Mar.). Bakora, âbuli (Bomb.).

Habitat :—Cultivated throughout India, a native of the Western Peninsula, in the Concan or Chittagong.

A shrub, with long branches, twigs compressed, thickened at nodes. Leaves small, 2-3in., obovate or oval-oblong, rounded or even, subcordate at base, acute, often cuspidate at apex, glabrous and shining, rather rigid, lateral veins somewhat conspicuous, pellucid; petiole extremely short; stipules, with a long rigid bristle, sub-persistent. Flowers rather large, shortly stalked, cymes lax, trichotomous. Calyx-segments, either short, with toothed margin, or longer and acute, shorter than ovary. Corolla-tube 1-1½in., very slender, lobes oblong-oval, acute or obtuse, about half as long as tube, spreading. Fruit ½in., nearly globose, purple, says Trimen. Bright scarlet, says K. R. K., in the specimens found throughout the Konkan, in uncultivated plants found in the jungles, where they are most conspicuous before the monsoons, with their beautifully scarlet flowers in showy tufts. The fruit is edible. There are many garden varieties bearing similar tufts of lemon-yellow flowers; pink flowers, large and small; pale cream-coloured flowers, with a tinge of red. Trimen has found all these forms of the plant in Ceylon. Brandis says that the plant is very common in the Western Peninsula, near the Western coast, also along the Ghats, on river banks. In Burma, only cultivated. An ornament of Indian gardens.

Uses :—In dysentery, 2 tolās of the flowers, fried in ghi (melted butter), are rubbed down with 4 gunjās each of Cumin and Nāgkesar, and made into a bolus with butter and sugar-candy, and administered twice a day (Dymock).

Asst.-Surgeon Amrita Lal Deb of Howrah, has found it very useful in dysentery. Drs. Bird and Pilcher have also favourably reported on its efficacy in that disease. (*Vide* I. M. G., Oct., 1878; p. 281.)

612. *Pavetta Indica*, Linn. H.F.B.I., III. 150.

Syn.:—*Ixora Pavetta*, Roxb. 129.

Sans.:—Pappāna.

Vern.:—Kûkûra-chûra (B.); Pâpat, tartari (Bom.); Pavuttay (Tam.); Malleamothe (Mal.); Paputta, Noonipapoota (Tel.); Kankra (Hind.).

Habitat:—Throughout India, from the Western Himalaya in Garwhal to Bhotan, and southwards to Ceylon.

A large shrub. Bark thin, smooth, brownish grey. Wood white to light brown, hard, close-grained (Gamble). Branches numerous, spreading, twigs cylindric, glabrous, or tomentose. Branchlets obtusely quadrangular, says Brandis. Leaves lanceolate or elliptic-lanceolate, sometimes obovate, acuminate, subacute, glabrous on both sides, dark green and shining above, with scattered large, thickened, hard warts, more prominent above than beneath; blade 3-9in. (Trimen), 4-9in. (Brandis), petiole $\frac{1}{4}$ - $\frac{1}{2}$ in., stipules connate, triangular, acute, thin, deciduous. Flowers very numerous on pedicels, longer than Calyx, white, rather fragrant. Cymes copious, lax, corymbose, terminal, glabrous, often with bracts below the branches. Calyx-segments, very small, tooth-like. Corolla-tube about $\frac{1}{2}$ in.. Lobes obtuse, about half length of tube; style exserted for fully $\frac{3}{4}$ in., very slender; stigma slightly clavate. Fruit $\frac{1}{4}$ - $\frac{5}{8}$ in. diam., nearly glabrous, polished, dark.

Uses:—The root is bitter, possessing aperient qualities, and is commonly prescribed by native doctors in visceral obstructions; given in powder to children, the dose is about a drachm or more (Ainslie).

Boiled in water, a fomentation is made from the leaves for hæmorrhoidal pains. The root is pulverised and mixed with ginger and rice water, and given in dropsy (Rheede).

Mr. H. M. Birdwood calls it "Matheran coffee."

613. *Morinda citrifolia*, Linn. *Var. bracteata*, H.F.B.I., III. 156.

Syn.:—*M. bracteata*, Roxb. 182.

Sans.:—Achchhuka.

Vern.:—Al (H.); Ach, Aich, Achhu (B.); Al; Bârtondi, nâgakuda, asemi (Bomb.); Munja-pavattay; Noona-maram (Tam.); Cada pilva (Mal.); Molagha; Maddichettoo (Tel.)

Var.:—*Bracteata*, hurdi, huldi kunj, rouch (B.)

Habitat:—Cultivated and wild (?) throughout the hotter parts of India.

A large shrub or small tree, glabrous, trunk straight, bark smooth, branches obtusely 4-angled. Leaves shining, usually 6-10 in., broadly elliptic, acuminate, acute or obtuse short-petioled, one of the pair next to the peduncle often suppressed. Stipules large, broadly oblong or semilunar, entire or 2-3-fid, glabrous. Peduncles solitary, rarely 2-3-nate at the ends of the branches, usually in the axils of every other pair of leaves, 1 in. long or more, supporting leaf not developed. Flowers 5-merous. Calyx-limb truncate. Corolla white, tube $\frac{1}{2}$ in. or less. Lobes glabrous, fusiform in bud, throat pubescent. Anthers partly exserted. Fruit of many drupes coalescent into a fleshy globose or ovoid head, pale, greenish-white, 1 in. diam.

Use:—The charred leaves made into a decoction with mustard are a favourite domestic remedy for infantile diarrhoea. The unripe berries, charred and mixed with salt, are applied successfully to spongy gums (Watt's Dictionary).

The Cochin Chinese believe the fruit to be deobstruent and emmenagogue (Ainslie.) The expressed juice of leaves is externally applied to gout, to relieve pain (Drury). In Bombay, the leaves are used as a healing application to wounds and ulcers, and are administered internally as a tonic and febrifuge (Dymock).

The root is used as a cathartic (Watt).

The oil is of a yellowish color, with a Sp. Gr. of 0.927 at 13°C. It is cloudy, owing to the separation from it of small crystals, which, recrystallised from alcohol, melt at 60°C., and, upon analysis, are shown to consist of paraffins. When freed from the crystals, the oil is almost entirely soluble in dilute caustic soda. In the solution capronic and caprylic acids as well as a trace of higher

aliphatic acids, can be detected. In the neutral part of the oil, which only amounts to a few per cent, ethyl alcohol can be detected after saponification; methyl alcohol and alcohols of a fusel-like odor are also probably present. The percentage of acids is over 90, a rare occurrence with essential oils. [J. Ch. I for Jan. 31, 1910, p. 110].

614. *M. tinctoria*, Roxb. H.F.B.I., III. 156; Roxb. 182, 183.

Sans.:—Achchuka.

Vern.:—A'l (H.); Ach, dâruharidrâ (B.); Achu (Uriya); Chaili, bankatari (Santal); Larnong, asûkhat (Assam); Ach, aich (C. P.); Manjishta (Bomb.); Maddi chettu, mulaga chettu (Tel.)

Habitat:—Throughout India.

A moderate-sized or small deciduous tree, usually pubescent or tomentose. Bark corky, bottle brown or grey, with numerous, deep, longitudinal cracks. Wood red, often yellow, with red streaks, moderately hard, close-grained. Leaves not shining, elliptic-obovate or lanceolate, blade 4-8, narrowed into petiole $\frac{1}{2}$ -lin. long. Peduncles solitary, axillary leaf opposed, frequently in short trichotomous panicles at the ends of branchlets. Flowers 5-merous. Corolla usually tomentose outside, tube, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, anthers exserted or included, syncarpium $\frac{3}{4}$ in. diam. [Syncarpium or syncarp is a multiple or fleshy aggregate fruit, such as the mulberry or magnolin.]

Use:—The root is used internally as an astringent. (Irvine).

615. *M. umbellata*, Linn. H.F.B.I., III. 157.

Syn.:—*M. Scandens*, Roxb. 184.

Vern.:—Noona-marum (Tam.); Moolooghoodoo (Tel.); A'l (Bomb.); Maddi-chekhi (Kan.)

Habitat:—Hills of Eastern Bengal and the Malay Peninsula, from the Khasia Mountains to Penang and Singapore; Western Peninsula, South Concan, Neilgherry and Travancore Mountains.

A large diffuse shrub, climbing by long tomentose, slender branches. Leaves rarely 5 in., usually membranous, from broadly ovate to elliptic or linear-lanceolate, obtuse, acute or caudate, acuminate, glabrous, pubescent or tomentose beneath; nerves very distinct. Stipules acute, connate. Petiole slender,

$\frac{1}{4}$ in. long. Heads in sessile terminal umbels. Corolla almost retuse, throat bearded; tube of Corolla short, not $\frac{1}{4}$ in. Fruit a syncarpium, of the size of large pea or larger, irregularly lobed.

Use:—Regarding this, Ainslie makes the following observations:—The leaves, in conjunction with certain aromatics, the Tamool doctors use in decoction, in cases of diarrhoea and dysentery, in the quantity of half a tea-cupful twice daily.

616. *Paederia foetida*, Linn. III. 195; Roxb. 229.

Sans.:—Prâsarani.

Vern.:—Khip, gandhali, gundali (H.); Gundhabhâ-duli (H.); Prasâram (Bomb.); Hiranwel (Mar); Bedoli sutta (Assam); Takpœdrik (Lepcha); Padebiri (Sikkim).

Habitat:—From the Central and Eastern Himalaya, southward to Malacca and westward to Calcutta.

A glabrous, foetid shrub. Leaves opposite, long-petioled, or nearly glabrous ovate or lanceolate, 2-6 by $\frac{3}{4}$ -2 $\frac{1}{2}$ in., base acute, rounded or cordate; petiole $\frac{1}{2}$ -1 in. Cyme branches opposite panicles 2-6 in. long, puberulous. Bracts minute, ovate, or subulate, ciliolate. Flower sessile and pedicelled. Calyx small, tube campanulate. Calyx-teeth short, triangular. Corolla $\frac{1}{2}$ - $\frac{2}{3}$ in., tomentose. Fruit $\frac{1}{2}$ - $\frac{1}{4}$ in., polished, crowned with conical disk and minute Calyx-teeth.

Uses:—The decoction prepared of the leaves is considered wholesome and nutritive for the sick and convalescent. The whole plant is regarded as a specific for rheumatic affections, in which it is administered both internally and externally (Dutt).

The roots are used by the Hindoos as an emetic (Roxburgh).

The juice of the leaves is considered astringent and given to children when suffering from diarrhoea: dose 1 drachm. (Surgeon Mukerji, in Watt's Dictionary).

"The fruit is used to blacken the teeth by Lepchas and Pharias; this, they say, is a specific against tooth-ache" (Gamble).

617. *Spermacoce hispida*, Linn. III. 200; Roxb. 125.

Vern. :—Nutteechoorie (Tam.); Thartavel (Mal.); Madana-ghanti (Tel.); Ghânta-chibaji (Concan); Madana ghanti (H.); Pitua arak (Santal).

Habitat :—Throughout India, from the Western Himalaya at Simla, to Assam, and southwards to Ceylon.

Procumbant herb, scabrid hispid or hirsute. Root-stock annual or perennial. Branches 6-14 in., ascending, stout, 4-angled. Leaves subsessile, $\frac{1}{2}$ -1 $\frac{1}{2}$ by $\frac{1}{3}$ - $\frac{2}{3}$ in., often rounded at the tip, rigidly coriaceous, ovate, spathulate, oblong or elliptic obtuse or acute, margins plater-waved, sometimes thickened and cartilaginous. Flowers 4-6 in a whorl. Calyx-teeth linear-lanceolate. Corolla $\frac{1}{2}$ - $\frac{1}{2}$ in., blue or white. Stigmas 2, very short. Capsule $\frac{1}{2}$ in. long, hispid or pubescent, rounded at base. Seeds oblong, granulate, opaque, very variable, $\frac{1}{10}$ - $\frac{1}{8}$ in. long, narrow or broad.

Use :—The root possesses properties similar to Sarsaparilla. It is used as an alterative, and is generally prescribed in the form of a decoction (Ainslie). The seeds have been recommended as a substitute for coffee.

618. *Rubia cordifolia*, Linn. H.F.B.I., III. 202.

Syn. :—R. Munjista, Roxb. 125.

Sans. :—Manjishtha.

Vern. :—Majith, Manjit (H. and Bomb.); Munjith, Aroona (B.); Manjiti, shevelli (Tam.); Poont (Mal.); Mandastic, Tamravalli (Tel.); Manjustha (Kan.); Itári (Bomb).

Habitat :—Throughout the hilly districts of India, from the N.-W. Himalaya eastwards, and southwards to Ceylon and Malacca.

A scandent herb. Root perennial, very long, cylindric, flexuose, with a thick cortex. Stems very long, often many yards, becoming slightly woody at base, flexible, tough, cylindric. Bark white, branches scandent, by means of the many numerous divaricate or deflexed branchlets and petioles, quadrangular,

sometimes prickly on the angles, smooth, shining. Leaves 4 in a whorl, $\frac{3}{4}$ -1 $\frac{1}{2}$ in.; ovate, cordate at base, tapering to acute apex, scabrous above and on the veins beneath, and especially on the margin, with small, white, recurved prickles, 5-or 7-veined from base, stiff, often convex above, with apex hooked, sometimes pubescent beneath. Petiole about twice as long as leaves, usually deflexed, tapering, stiff and branchlike, deeply channelled above, triangular, with many sharp recurved prickles on the angles. Flowers, 5-merous, minute, on short, glabrous pedicels, cymes lax, trichotomous, glabrous. Anthers globose. Corolla-tube thick, very short, lobes ovate, obtuse. Fruit about $\frac{1}{2}$ in., very didymous, the carpels almost distinct, smooth, shining, purplish black. The Ceylon plant, says Trimen, has the stem almost destitute of prickles. "A very variable plant. The Khasian specimens have usually 3-nerved leaves, not impressed above; in Western Peninsula the nerves are 5-7, and deeply impressed." (Hooker).

Uses:—In Hindoo medicine, it is chiefly used as a coloring agent. It is useful as an astringent in external inflammations, ulcers and skin diseases, &c. Chakradatta recommends Madder, rubbed with honey, as an application to the brown spots of pityriasis versicolor (Dutt).

The Mahomedans consider the drug to be deobstruent, and prescribe it in paralytic affections, jaundice, obstructions in the urinary passages and amenorrhœa. They mention the fruit as useful in hepatic obstruction, and a paste made from the roots with honey, as a good application to freckles and other discolorations of the skin. The whole plant is reputed to be alexipharmic (Dymock).

Ainslie says that an infusion of the root is prescribed by the Hakims to women after delivery, to procure copious flow of lochia.

Dr. G. Playfair, in a note appended to his translation of the *Talif-i-Sharifi* (p. 150), states that, if taken to the extent of about 3 drachms, several times daily, it powerfully affects the nervous system, inducing temporary delirium, &c., with evident determination to the uterine system (Ph. Ind.).

N. O. VALERIANEÆ.

619. *Nardostachys Jatumansi*, De. III. 211.

Sans. :—Jatamānsi.

Vern. :—Balchar (H.) ; Billi-lotan (Dec.) ; Sumbul (Bom.).

Habitat :—Alpine Himalaya, from Kumaon to Sikkim.

An erect perennial herb. Root-stock woody, long, stout, covered with fibres from the petioles of withered leaves. Stem 4-24in., more or less pubescent upwards, often glabrate below subscapose. Radical leaves 6-8 by 1in., longitudinally nerved, glabrous or slightly pubescent, narrowed into the petiole ; cauline leaves 1-2 pairs, 1-3in. long, sessile, oblong or subovate. Flower-heads usually 1, 3-5 ; bracts $\frac{1}{2}$ in., oblong, usually pubescent. Corolla-tube $\frac{1}{2}$ in. long, somewhat hairy within, as are the filaments below. Fruit $\frac{1}{2}$ in. long, covered with ascending white hairs, crowned by the ovate, acute, often dentate calyx-teeth. C. B. Clarke says :—“ There are two forms of this plant : a large flowered, with usually glabrous bracts, and a smaller one, with Corolla-tube, scarcely $\frac{1}{2}$ in. long, and the bracts densely, shortly hairy ; various intermediates occur ” (P. 211, Vol III H. F B I).

Uses :—It is prescribed by Hindoo physicians as a nervine tonic and aromatic adjunct, in the preparation of medicinal oils and ghrītas (butter) (Dutt).

The author of the Makhzan considers it to be deobstruent and stimulant, diuretic and emmenagogue, and recommends it in various disorders of the digestive and respiratory organs, and as a nervine tonic in hysteria. He also notices the popular opinion that it promotes the growth and blackness of the hair. In doses of 45 grains, it is often employed as an expectorant in coughs and colds (Dymock.)

Ainslie says that in Southern India, the Vytians prepare a fragrant and cooling liniment from this drug, to be applied to the head and used internally as a blood purifier.

According to Sir Wm. O'Shaughnessy, it is a perfect representative for Valerian.

The roots are aromatic and bitter in taste. They are supposed to possess tonic, stimulant, and antispasmodic properties, and are often employed in the treatment of epilepsy, hysteria, and convulsive affections (Watt). Used in palpitation of the heart (Thompson, in Watt's Dictionary).

620. *Valeriana officinalis*, Linn, H.F.B.I., III. 211.

Vern.:—Jal-lakri (H.); Kálá vála (Mar.); Jalalakan, billilotan (Ajmere).

Habitat:—North Kashmir; Sonaming; Kunzlwán.

Perennial herbs, subglabrous. Rootstock short, suberect, hardly thicker than the stem, stoloniferous. Stem 1-3ft., erect, corymbose above, nodes minutely hairy. Leaves pinnate, segments numerous, narrow, entire or toothed. Radical leaves 0 at flowering time or pinnate. The leaves on lateral offsets in autumn near the root are often ovate, entire or slightly toothed. Cauline leaves several, all pinnate. Upper bracts $\frac{1}{10}$ in., oblong-linear, shorter than the fruits.

Uses:—The root is officinal, being stimulant and antispasmodic. It is useful as an antispasmodic in hysteria, epilepsy, chorea and allied affections. As a stimulant, it is used in the advanced stages of fevers, low asthenic inflammations, &c. (Pharm. Ind.) As an antispasmodic, it is much inferior to assafoetida. In excessive doses, it causes headache, mental excitement, indicating a deranged state of the nervous system. In intermittents, it has been useful when combined with cinchona bark or other tonics. Baths of Valerian have been found very useful in acute rheumatism. The volatile oil of Valerian is also a good form of administration (Bentley & Trimen).

621. *V. Wallichii*, DC. H.F.B.I., III. 213.

Syn.:—*V. Jatamansi*, Roxb. 55.

Vern.:—Mush kwáli, bala (Pb).

Habitat:—Temperate Himalaya, from Kashmir to Bhotan, and Khasia Mountains.

A pubescent, perennial herb. Rootstock horizontal, thick, with thick descending fibres. Radical leaves several, 1-3in. diam., deeply cordate or cordate-ovate, usually acute and toothed, long-petioled. Cauline leaves few or much smaller, entire or pinnate. Corymb 1-3in. diam., not very lax even in fruit. Bracteoles oblong-linear, as long as the fruits. Fruit hairy or nearly glabrous.

Use:—The roots are exported to the plains, and are used medicinally, like *V. Hardwickii* (Stewart).

622. *V. Hardwickii*, Wall. H.F.B.I., III. 213.

Vern:—Tágger (H. and B.); Tagger-ganthoda (Bomb.); Chammaha (Nepal); Naháni, chár, bála, taggar (Pb.); Shumeo, asárun (Kumaon); Char (C. P.).

Habitat:—Temperate Himalaya, from Kashmir to Bhotan, and Khasia Mountains.

A perennial herb, pubescent below. Rootstock hardly thickened, descending, fibrous. Stem 1-5ft., erect, usually simple or corymbose only upwards, above often glabrous, nodes little pilose. Leaves pinnate, pinnules 1-5 or lanceolate, acute. Radical leaves undivided, usually disappearing before fruit-time; long-petioled, ovate acute. Cauline leaves several, leaflets often 3, rarely more than 5, upper smaller. Corymb in fruit lax, often 1ft., repeatedly dichotomous, ultimate branchlets very small; upper bracteoles much shorter than the fruit. Fruit hairy.

Use:—The medicinal properties attributed to it by the author of the *Makhzan* resemble those of *N. Jatâmânsi*. Royle says that the drug is used medicinally in Nepal and Northern India. There can be little doubt that it would prove an efficient substitute for valerian (Dymock).

623. *V. Leschenaultii*, DC. Var. *Brunoniana*, W. & A. H.F.B.I., III 214.

Habitat:—Neilgherry Mts., frequent.

A perennial herb, glabrous, or very slightly puberulous. Rootstock short, enveloped by thick fibres. Stem erect, with 1-2 pair of leaves near the root, and another small pair about the

middle, slightly hirsute on the knots. Leaves opposite, stipulate, somewhat fleshy, lower ones quite entire, ovate bluntly acuminate, long-petioled, radical ones often emarginate at the base; uppermost or small pair somewhat sessile, narrow oblong, entire or toothed along the margin. Corymb terminal, trichotomous, panicle, with a pair of foliaceous bracts, similar to the uppermost leaves subtending the principal branches. C. B. Clarke describes this plant in Hooker's F. B. I., Vol III, p. 214, as a variety of *V. Leschenaultii*, D.C., and says that the cauline leaves are small, undivided or hardly any, fruit glabrous. Clarke further observes thus:—The scapose form has sometimes hairy fruits and Wight has been unable in his own herbarium to settle what he would call *V. Leschenaultii* and what *V. Brunoniana*.

Use:—It affords a root which develops a strong odour of valeric acid when dry, and yields to distillation with water a considerable amount of volatile oil. Dr. G. Bidie has recommended it as a good substitute for European Valerian (*Pharmacographia Indica* II p. 240.)

N. O. DIPSACEÆ.

624. *Morina persica*, Linn. H.F.B.I., III. 216.

Vern.:—Bekh ahmar (H.)

Habitat:—Western Himalaya, from Kashmir to Kumaon.

Glabrous or softly pubescent herbs. Stems tall, 1½-4ft. Leaves 6 by lin., sessile, up to 9in., doubtly spinous-toothed hard, pubescent or glabrous. Flowers in axillary clusters; white or faintly tinged with pink. Spikes elongate. Bracts free or nearly so, and involucels hairy or villous. Calyx-lobes subequal, obovate, oblong, entire or emarginate. ½-⅓in., by ⅓-¼in. Corolla-tube 1-1½in. Stamens 2 perfect, 2 rudimentary. Filaments longer than the Corolla-lobes. Stigma broad, disk-like. Achenes free within the involucl. In Kerner's Natural History of Plants 11,352. Oliver's English Translation, 1895, London, the flower of *Morina persica* is cited as instance of Autogamy "by

the bending of the style to bring the stigmas into direct contact with the anthers belonging to the same flower or to place them in such a position beneath the anthers as to ensure their catching any pollen that may fall out of the loculi " (K. R. Kirtikar).

Use:—Mentioned in the 'Punjab Products' amongst drugs, but no medicinal properties are given. Dr. Dymock, in a letter to Dr. Watt, states that he suspects the same species may prove the source of the Red Behen or Bahman of the Persians (Watt).

N. O. COMPOSITÆ.

625. *Lamprachaenium microcephalum*, Benth.
H.F.B.I., III. 229.

Vern.:—Brahma-dandi (Bomb.).

Habitat:—The Concan; at Parwar Ghat, Bombay.

An erect, branched annual. Branches slender, glabrous. Stem 1-2ft., simple or branched from the base, glabrous hairy glandular. Leaves petioled, 2-4in. hairy above, white tomentose beneath. Heads $\frac{1}{4}$ - $\frac{1}{2}$ in. diam.; peduncles slender, hispid or glabrate. Involucre bracts acute, ciliate, none leafy, erect or recurved. Achenes $\frac{1}{2}$ in. Pappus reddish, equalling the Corolla tube.

Use:—Used medicinally as an aromatic bitter (Dymock). It smells of chamomile.

626. *Vernonia cinerea*, Lees. H.F.B.I., III. 233.

Syn.:—*Serratula cinerea* Roxb 594.

Sans.:—Sahadevi.

Vern.:—Pápar; Kunchli (Chutia Nagpur.) Kuksim, (B.); Sira-shengalanir (Tam.). Moti Sádori (Bomb.).

Habitat:—Throughout India.

One of the commonest weeds throughout India, and Ceylon, abundant everywhere. A pubescent, annual, erect herb. Stems

6-12in., or even 2ft., erect, stiff, cylindric, striate, more or less pubescent, slightly branched. "Sometimes decumbent at the base, grooved" (Collet). Leaves alternate distant, the lower 2in., but generally smaller upwards, nearly sessile, lanceolate, or ovate, broadly oval to linear-lanceolate, tapering to the base, subobtusate, apiculate, coarsely and shallowly crenate-serrate, more or less hairy on both sides, $\frac{1}{2}$ -1 $\frac{1}{2}$ in.; teeth few, coarse. Petiole $\frac{1}{4}$ - $\frac{3}{4}$ in. Heads numerous, $\frac{1}{2}$ in. diam., small, on long stalks, in lax divaricate terminal corymbs. Involucre-bracts linear, mucronate; silky, outer ones smaller than the inner. Flowers 20-25, bright, pinkish-violet; pappus white; outer row very short. Achenes not ribbed, hairy terete, $\frac{1}{8}$ in. A very variable plant.

Uses.:—Used in medicine by the Hindus in decoction, to promote perspiration in febrile affections (Ainslie). The expressed juice of the plant is given in piles (B. D. B.).

The seeds are employed in Patna as an alexipharmic and anthelmintic, and as a constituent of masálas for horses (Irvine). In Chutia Nagpur, the whole plant is given as a remedy for spasm of the bladder and strangury; the flowers are administered for conjunctivitis (Campbell). The latter use is interesting, since, according to Piso, the leaves of another species of the same genus are similarly employed in Jamaica. (Watt.). In Chutia Nagpur, root is given for dropsy (J. J. Wood's Plants of Chutia Nagpur, p. III.).

627. *V. anthelmintica*, Willd., III. 236.

Syn.:—*Serratula anthelmintica*, Roxb. 594.

Sans.:—Somarája; Avalguja; Vákuchi.

Vern.:—Káli-ziri; Bukchi (H. and B.); Káralye (Mar.); Kattu shiragam, Neernoochie (Tam.); Neela-vayalie, Adaviezula-kuru (Tel).

Habitat:—Throughout India, from Kashmir to Ceylon.

A tall, robust, leafy annual, branched, glandular-pubescent, stem 2-3ft., much branched striate, often blotched with purple. Leaves petioled, 3-8in., rather membranous, lanceolate or

ovate-lanceolate, coarsely serrate. Heads $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., about 40-fid, subcorymbose. Involucre-bracts linear, with broad purplish tips. Achenes $\frac{1}{2}$ in., 10-ribbed, pubescent; outer pappus rather longer, shining, reddish, flattened, deciduous; inner very short, rigid, paleaceous.

Uses:—In Hindoo medicine, the seeds are of great repute as a medicine for leucoderma and other skin diseases, and also used as an anthelmintic in combination with other remedies (Dutt).

The author of the *Makhzan* informs us that it is given internally to remove phlegm and worms from the intestines, and that a poultice or plaster of it is used to disperse cold tumors. It is much used as a cattle medicine (Dymock).

The seeds are considered as powerfully anthelmintic, and are also an ingredient of a compound powder prescribed in snake bites. (Ainslie.) On the Malabar Coast an infusion of the seeds is given for coughs and against flatulency. (Rheede.)

In the Concan, the following formula is in vogue as an anteperiodic; vernonia seeds, chiretta, picrorrhiza root, dikamâli, rocksalt and ginger, p. æq. powder, and give 6 massâs in cold water, in which a red hot tile has been quenched, every morning (Dymock).

The juice of the leaf is given to cure phlegmatic discharges from the nostrils (Agra Exhibition).

Dr. Æ. Ross speaks favorably of an infusion of the powdered seeds (in doses of from 10 to 30 grains) as a good and certain anthelmintic for ascarides. In Travancore, the bruised seeds, ground up in a paste with limejuice, are largely employed as a means of destroying pediculi. Dr. Gibson regards them as a valuable tonic and stomachic, in doses of 20 to 25 grains; diuretic properties are also assigned to them (Ph. Ind.).

They are also given in anasarca and used for plasters for abscesses (Watt).

The seeds are in the Punjab considered febrifuge (Baden-Powell).

The seeds on extraction with ether yielded 18.25 per cent. of a dark brown coloured and strong smelling oil with some resinous matter. The expressed

oil is of a light yellow colour and very viscid; it deposits "stearin" on standing.

Physical and chemical characteristics.—Fat: Specific gravity at 100°, 0.9168; acid value, 58.2; saponification value, 202.88; Reichert-Meissl value, 7.88; iodine value, 71.0; unsaponifiable, 1.79; butyro-refractometer at 25°, 75°. Fatty acids: per cent. 91.6; melting point, 35.6°; iodine value, 73.4; neutralisation value, 195.1; mean molecular weight, 287.4. (A. K. Menon.)

628. *Elephantopus scaber*, Linn., H.F.B.I., III. 242; Roxb. 607.

Sans.—Gojivhâ.

Vern.—Gobhi (H.); Kalia gangawan (Chanda, C.P.); Gojialatâ, Samdlullum (B.); Hastipata, Mhâka, Pâthri (Bomb.); Anashovadi (Tam.); Tâl Mûli; Mûrgi Chûndi (Jaspur).

Habitat.—Throughout India, from the Punjab.

A rigid, perennial herb, dichotomously branched, 1-2ft., high, strigose, scabrid and villous. Leaves alternate. Radical leaves ovate, oblong, crenate. Cauline leaves few, sessile. Head clusters of lin. diam., surrounded by cordate, leafy bracts. Involucre-bracts pungent, dry, stiff, alternately flat and conduplicate; receptacle naked. Flowers violet or purple, all equally 4-lobed and cleft on one side and with lobes spreading somewhat palmately. Anthers bases obtuse. Style arms subulate. Achenes truncate, hairy, 10-ribbed, pappus of 4-5 rigid bristles, shining, slender, and dilated at the base, or chaff-like. The most noteworthy point with reference to this plant is that the embryo not unfrequently germinates in the head.

Uses.—A decoction of the root and leaves is given, on the Malabar Coast, in cases of dysuria (Rheede).

In Travancore, the natives are reported to boil the bruised leaves with rice, and give them internally for swellings or pains in the stomach (Watt).

In Chutia Nagpur, a preparation from the root is given for fever (Revd. A. Campbell).

629. *Ageratum conyzoides*, Linn., H.F.B.I., III. 243.

Syn.—*A. cordifolium*, Roxb. 597.

Vern.—Dochunti (B.); Osâdi, Sahadvi, Gomera (Bomb.)

Habitat.—Throughout India.

An erect, annual herb, 1-2ft., hispidly hairy. Stem branched, terete. Leaves petioled, ovate, crenate. Heads many, small, in dense terminal corymbs, Bracts striate, acute. Ray-flowers many, pale-blue or white. Achenes black, pappus scales 5, awned, often serrate below.

Uses.—The whole plant has a strong aromatic, rather disagreeable smell, and has a reputation among the Hindus as an external application in agues; it is also worn as a charm against ague when dug up on Sunday morning with the proper ceremonies. The juice is also said to be a good remedy for prolapsus ani; it is freely applied, and the parts replaced (Dymock). The juice of the root is said to possess antilithic properties (K.R.K.).

630. *Eupatorium cannabinum*, Linn, H.F.B.I., III. 243.

Habitat.—Temperate Hamalaya, and the Khasia Mountains.

A tall, coarse, pubescent or puberulous herb. Leaves simple or trisect, lanceolate, coarsely serrate. Corymbs many, rounded. Heads $\frac{1}{2}$ in. long. Inner involucere-bracts subacute.

Use.—"Was strongly recommended by Tournefort as a deobstruent in visceral obstructions, consequent to intermittent fevers, and externally as a discutient in hydropic swellings of the legs and scrotum" (Fleming).

631. *E. ayapana*, Vent., H.F.B.I., III. 244.

Vern.—Ayâpâna (Mar.)

Habitat.—An American plant, naturalized in many parts of India. I have seen it in Bombay. I grew it in my Ratnagiri garden in 1900-1904. K. R. K.

A small shrubby plant, 5 to 6 feet high; branches straight, reddish, with a few simple scattered hairs; young shoots have a somewhat mealy appearance, due to the presence of small particles of a white balsamic exudation; leaves opposite, in pairs, their bases uniting round the stem, about 4 inches long and $\frac{3}{4}$ inch broad, fleshy, smooth, lanceolate, attenuated at the base; midrib thick and reddish; flowers like those of the groundsel, purple. The odour of the plant is aromatic,

somewhat like ivy, but more agreeable; taste bitter and aromatic, peculiar (Dymock).

Uses.—At the Mauritius, it is in great repute, and the leaves are considered as alterative and antiscorbutic. An infusion of the leaves has an agreeable and somewhat spicy taste, and is a good drink, when fresh and bruised. They are one of the best applications I know of for cleaning the face of a foul ulcer (Ainslie).

For long it held a high position as a medicinal plant, but the exaggerated ideas of its virtues have now exploded. It is a good simple stimulant, tonic and diaphoretic. In cholera, it has been used to restore warmth to the body, and it is said also to be used internally and externally in the treatment of snake-bite (Ph. Ind.).

Ayâpâna may be compared with chamomile in its effects; it is stimulant and tonic in small doses, and laxative when taken in quantity; the hot infusion is emetic and diaphoretic, and may be given with advantage in the cold stage of ague and in the state of depression which precedes acute inflammatory affections. The infusion may be made with 1oz. of the herb to a pint of water, and be given in 2oz. doses, every three hours (Dymock).

632. *Solidago Virga-aurea*, Linn. H.F.B.I., III. 245.

Habitat :—Temperate Himalaya, from Kashmir eastwards, alt. 5—9,000ft. Khasia Mts., alt. 4—6,000ft.

A perennial, glabrous, or pubescent herb; stem erect, stout, subsimple 6-24in. Lower leaves petioled, ovate or oblong subserrate, upper smaller, narrower entire, heads 1-4 on short axillary peduncles collected in a long leafy panicle. Involucre-bracts narrow, acute. Ray-flowers about 8, Achense glabrous or puberulous.

Uses :—In English the plant is called *Woundwort*, from its reputation as a vulnerary. The flowering herb contains a volatile oil, is of an aromatic odour and a bitterish and astringent taste.

It is reported to have been used very successfully by Dr. Mascarel in cases of dropsy (*La France Medicale*, Oct. 8, 1889). He reduces the dried plant—stems, leaves and flowers—to a coarse powder, and gives it in doses of one tablespoonful, beaten with an entire egg (yolk and white). He gives but one dose on the first day; but on each of the following days he adds a tablespoonful, until seven or eight doses are being taken during the twentyfour hours. The diuresis is said to continue until œdema permanently disappears.

Very little is known about the chemistry of this genus. Volatile oils have been obtained from 4 American Species but with the exception of *Solidago canadensis*, L. nothing is known about their chemistry. Chemical Abstracts, Feb. 20 p. 521.

633. *Grangea maderaspatana*, Poir., H.F.B.I.,
III. 247.

Syn.—*Artemisia maderaspatana*, Roxb. 600.

Vern.—Mustarû (Hind.); Namuti (Beng.); Afsanteen (Arab); Baranjâsif kowli (Pers.); Mashî pattiri (Tam.); Douana (Kan.); Nelampala (Mal.); Savi (Tel.)

Habitat.—Throughout India, from the Punjab eastwards and southwards.

Annual, stems numerous, spreading from centre, prostrate, 6-12 in., hairy branched, buds white woolly. Leaves numerous, 1½-2½ in., sessile, deeply, sinuately pinnatifid, with 2-4 pair of opposite or sub-opposite lobes, smaller towards the base, terminal part larger, all coarsely serrate, dentate, pubescent. Heads yellow, ¾ in., depressed, globose, on short pedicels, usually in pair on leaf opposed peduncle; involucre-bracts oval, obtuse, thick and rigid, pubescent. Corolla-tube campanulate above, persistent, lobes acute; pappus hairs connate into a cylindric fimbriate tube. Achenes glandular, 1/10 in., long including the pappus tube.

Uses.—The leaves are regarded as a valuable stomachic and to possess deobstruent and antispasmodic properties, and are prescribed in infusion and electuary in cases of obstructed menses and hysteria. They are also sometimes used in pre-

paring antiseptic and anodyne fomentations (Ainslie, Mat. Ind. I., p. 483.)

The juice of the leaves is employed as an instillation for ear-ache (Kinsley, in Watt's Dictionary).

634. *Erigeron asteroides*, Roxb. H.F.B.I., III. 254 ; Roxb. 603.

Vern.—Māredi, Sonsali (Bomb.).

Habitat.—Tropical Himalaya ; Nepal, Sikkim, Bengal and the Western Peninsula.

A coarse annual, 1-2ft. high, erect, or in a dwarf state, decumbent ; pubescent or villous. Branched. Radical leaves obovate, petioled. Cauline leaves $\frac{1}{2}$ -1in., numerous, obovate or oblong, $\frac{1}{2}$ -amplexicaul, all toothed or lobulate. Involucre-bracts 1-2-seriate, very narrow, with their hair points much shorter than the pappus. Heads $\frac{1}{4}$ - $\frac{1}{2}$ in., peduncled, solitary or corymbose. Ligules capillary, rather blue, longer than the dirty white or reddish pappus. Achenes very minute, $\frac{1}{50}$ in., nearly glabrous, flat, pale.

Uses.—Dr. Dymock writes that he noticed it, being offered for sale in the bazaar as a stimulating and diuretic medicine. Several species of *Erigeron* are used as diuretic in America.

635. *Blumea lacera*, DC., H.F.B.I., III. 263.

Syn.—*Conyza lacera*, Roxb. 601.

Sans.—Kukuradru.

Vern.—Kôkrondâ, Kukkurbandâ, Jangli-mûli (H.) ; Kukur-sungâ, bura-sûksung (B.) ; Nimurdi (Bomb.) ; Jangli-kâsni, jangli-mulli, divâri-mulli (Duk.) ; Nârak-karandai, Kattumullângi (Tam.) ; Kârni pogâku, advi-mulangi (Tel.).

“Kakronda and other vernacular names are applied to more than one allied species of *Blumea* and *Laggera*, without much regard to the color of their flowers” (Moodeen Sheriff).

Habitat :—Throughout the plains of India, from the N.-W. Himalaya to Travancore.

A hairy, villous, or glandular, rarely glabrescent herb, stem erect, simple or branched very leafy, rarely 2ft. high. Leaves

petioled obovate, toothed or serrate, rarely lobulate. Heads $\frac{1}{3}$ in., in short axillary cymes and collected in terminal spiciform panicles, rarely corymbose. Involucre-bracts narrow, acuminate, hairy. Receptacle glabrous. Corolla yellow, lobes of hermaphrodite flowers nearly glabrous, pappus white. Achenes sub-4-goneus, not ribbed, glabrate.

Uses:—The fresh root held in the mouth is said to relieve dryness (U. C. Dutt).

Mixed with black pepper it is given in cholera (Watt).

The expressed juice of the leaves is a useful anthelmintic, especially in cases of thread-worm, either internally or applied locally (Surg. J. Anderson, Bijnor). Used by many Hospital Assistants and highly thought of by them as a febrifuge and astringent. Is an invaluable remedy in Tinea Tarsi (Asst.-Surg. Bollye Chand Sen, Campbell Med. School, Sealdah), in Watt's Dictionary.

The expressed juice of the leaves, mixed with black pepper, is given in bleeding piles.

It is also given in retention of urine.

636. *B. eriantha*, DC., H.F.B.I., III. 266.

Vern.:—Nimurdi (Mar.).

"Under the names of Bhâmburdi (Mar.) Kalara and Châ-chari-mari, 'flea-killer' (Guz.), several kinds of *Bhumea* are used indiscriminately by the natives of Western India" (Pharmacographia Indica, Vol. II., p. 255).

Habitat:—The Concan; Banda.

A prostrate or decumbent herb, pubescent or tomentose, or clothed with scattered long hairs, rarely silky, villous. Stems 1 ft., very slender, dichotomously divaricately branched from the base. Leaves 1-3 in., acutely irregularly toothed, the teeth often subspinescent; lower leaves petioled, obovate, obtuse, upper sessile, obovate or oblong-acute. Heads small, $\frac{1}{4}$ - $\frac{1}{3}$ in. mostly, on the long slender peduncles of dichotomous cymes, rarely fascicled. Peduncles and involucre clothed with long, silky, hairs, receptacle glabrous, pappus white, achenes very minute, angles minute, sparingly silky.

The very woolly white undersurfaces of the leaves, which, however, Kurz unites with balsamifera, perhaps as Clarke thinks rightly, but the Corolla-lobes in this are hairy, and very glandular in balsamifera.

Use:—The juice of the plant is administered as a carminative, and the herb used along with the leaves of *Vitex Negundo* and *Careya arborea* for fomentations. A warm infusion is given as a sudorific in catarrhal affections, cold it is considered to be diuretic and emmenagogue.

637. *B. densiflora*, DC., H.F.B.I., III. 269.

Syn.:—*B. grandis*, D.C.; *B. Milnei*, Seem.

Vern.:—Pung-ma-theing (Burm.).

Habitat:—Tropical Himalaya; Sikkim; Assam; Mishmi and Naga Hills, and Khasia Mountains.

Herbs with a stout stem. Panicles and leaves beneath densely tomentose, or clothed with thick white felted wool. Leaves very large, 8-18in., broadly elliptic or elliptic-lanceolate, narrowed into a long, winged, sometimes appendaged, petiole, puberulous above serrate-toothed or pinnatifid. Heads $\frac{1}{2}$ in. diam; sessile, in rounded clusters, in a large branched panicle. Involucre-bracts narrow, rather rigid. Receptacle narrow, glabrous. Corolla-lobes of hermaphrodite flowers hairy. Pappus red. Achenes 10-ribbed, pubescent (J. D. Hooker).

Use:—A few years ago, Mr. E. O'Riley prepared camphor from this plant which was pronounced identical with that imported from China (Watt).

638. *B. balsamifera*, DC. H.F.B.I., III. 270.

Syn.:—*Conyza balsamifera*, Linn. Roxb. 601.

Vern.:—Kakarondâ (H.); Kalâhâd (Guz.); Bhamburdâ (Mar.).

Habitat:—Tropical Himalaya; Nepal and Sikkim, Assam, Khasia Mountains, Chittagong, and the Eastern Peninsula.

An erect, green, short-lived shrub, or small tree, branches,

leaves and inflorescence densely tomentose or villous, or silkily woolly. Stem tall, corymbosely branched above. Sometimes this plant springs up gregariously in sites of previous temporary cultivation in the Eastern Himalaya and in the hill country, from thence to and through Burma. Leaves 4-10in., coriaceous, elliptic oblong-lanceolate, serrate, sometimes pinnatifid, narrowed into a usually auricled short petiole $\frac{1}{2}$ -1in. long. Heads yellow, $\frac{1}{4}$ - $\frac{1}{2}$ in. diam., sessile, densely clustered on the branches of a large terminal, spreading or pyramidal, leafy panicle. Involucre-bracts tomentose. Receptacle glabrous. Pappus red. Achenes 10-ribbed, silky.

The most arboreous of all the species, smelling strongly of camphor—J. D. Hooker.

Use :—A warm infusion, acts as a pleasant sudorific, and it is a useful expectorant as a decoction. (Watt.)

639. *Pluchea indica*, Less, H.F.B.I., III. 272 ; Roxb. 601.

Vern :—Munghu rûkha ; Kukronda (B.).

Habitat :—Sunderbunds.

A low shrub, glabrous, or nearly so. It is an evergreen large shrub in the tidal and beach forests, from the Hughli round the coast of Chittagong, Arracan and Burma (Gamble). Leaves ovate obtuse more or less dentate, 1-2in., acute or apiculate, often gland-dotted. Narrowed into a short slender petiole. Corymbs pubescent. Heads $\frac{1}{2}$ in. diameter, in compound terminal corymbs. Outer involucre-bracts broad, tips rounded. Flowers of disk hermaphrodite, of ray, female, numerous. Achenes minute, ribbed, nearly glabrous ; pappus scanty, white, spreading.

Use :—The root and leaves are employed medicinally in Patna as astringents and in cases of fever (Irvine).

640. *P. lanceolata*, Oliv. H.F.B.I., III. 272.

Vern :—Ra-sana (Pb.) ; Kourasana (Sind.) ; Marwande (Pushtu) ; Chota kalia (Raj.) ; Banserai (Aligarh) ; Choti Kalia (Agra) ; Sorahi (Cawnpore).

Habitat :—Upper Bengal, at Cawnpore, Oudh, and westward to the Punjab and Scind.

A shrubby, hoary-pubescent plant. Branches rather slender. Leaves 1-2in., sessile, very coriaceous, oblong oblanceolate, pungent, quite entire, strongly nerved; pale when dry; nerves very oblique on both surfaces. Heads in compound corymbs, longer than broad. Involucre contracted at the mouth, bracts short, rounded; outer bracts hoary.

Use :—The leaves are aperient, and are used as a substitute for Senna (Murray).

641. *Sphæranthus indicus*, Linn. H.F.B.I., III. 275.

Syn. :—*S. mollis*, Roxb. 608.

Sans. :—Mundi; Munditika.

Vern. :—Mundi. Gorakhmundi (H. and Bomb.); Murmuria, Chagul-nudie (B.); Kottak-karandai (Tam.); Boda-tarapu (Tel.); Miran-gani, attakâ manni (Mal.).

Habitat :—Tropical Himalaya, from Kumaon to Sikkim; Assam, Silhet, and southwards to Ceylon; common in rice fields.

A low annual, about 1ft. high, with spreading branches, long, divaricate, ascending, with toothed wings, glandular tomentose or villous. Stem cylindrical, strongly winged with the sharp-toothed decurrent bases of the leaves. Leaves 1-2in., sessile, decurrent, oval, slightly tapering at the base, obtuse or subacute, sharply spinous-serrate, very glandular, and also with long white hair on both sides, glaucous-green; compound heads $\frac{3}{8}$ - $\frac{5}{8}$ in., ovoid, globose, on winged peduncles, heads very numerous, densely packed, purple bracts, linear acuminate, rather shorter than flower-heads, ciliate at the end; achenes stalked, smooth.

Parts used :—The seeds, root, bark and flowers.

Uses :—The oblong seeds and the root are considered by the Hindus to have anthelmintic properties.

The powder of the root is considered stomachic, and that the bark ground and mixed with whey, is a valuable remedy for piles (Rheede).

Dr. Horsfield reports that in Java it is considered as a useful diuretic.

The author of the *Makhzan* speaks of it as a powerful tonic, deobstruent and alterative, and observes that the odour of the plant may be perceived in the urine and perspiration of those who are taking it. The administration of the drug is recommended in bilious affections, and for the dispersion of various kinds of tumors. He also informs us that the Hindus use the bark, and make a kind of confection of the young plant by rubbing it up with clarified butter, flour and sugar; a portion of this taken daily is said to be a good tonic, and to prevent the hair turning white or falling off. An oil, prepared from the root, by steeping it in water and then boiling in oil of Sesamum until all the water is expelled, taken fasting every morning, for 41 days, in doses of 2 dirhems, is said to be a powerful aphrodisiac (Dymock).

In the Punjab the flowers are highly esteemed as alterative, depurative, cooling and tonic. (Stewart.)

642. *Anaphalis neelgerriana*, DC., H.F.B.I.,
III. 287.

Vern. :—Kaat-plaster (Nilgiris).

Habitat :—Nilgherry Mts.; alt. 7-8,000ft.

A perennial, wholly clothed with cottony wool, branches very many, crowded on a stout woody stock, some very short, densely leafy, flowerless, others 4-10in. long and flower-bearing. Leaves $\frac{1}{2}$ - $\frac{1}{2}$ in., narrowly linear, those on the flowerless branches and base of the flowering parts most dense, spreading and reflexed, on the upper part of the flowering branches erect, all acute with recurved margins, heads $\frac{1}{8}$ - $\frac{1}{4}$ in. diam. sessile, most densely crowded or solitary or in corymbose clusters; margins of leaves revolute. Involucre-bracts. $\frac{1}{8}$ in.,

long, elliptic-oblong or lanceolate, obtuse or acute, white, opaque.

Use.—The fresh leaves are bruised and applied to the wound under a rag.

The authors of the *Pharmacographia Indica* write that "other species (of *Anaphalis*) are used on the Nilgiris for cut wounds."

643. *Gnaphalium luteo-album*, Linn, H.F.B.I., III. 288.

Syn.:—*G. orixense* and *G. albo-luteum*, Roxb. 600.

Vern.:—Bâl-raksha (Pb.).

Habitat:—From Kashmir and Sikkim throughout India.

A woolly, very variable annual, 4-12 in. high. Stem corymbosely branched above. Leaves woolly on both surfaces, sessile 1-2 in. long, rarely more than $\frac{1}{2}$ in. broad, oblong-spathulate, obtuse; upper lanceolate acute, half-amplexicaul. When leafless, there are instead dense corymbose clusters of glistening heads, whitish yellow or brown. Involucre-bracts oblong obtuse. Achenes tubercled, or with minute curved bristles.

Use:—The leaves are said to be officinal in the bazaars of the Punjab (Watt).

644. *Inula racemosa*, Hook. f. H.F.B.I., III. 292.

Vern.:—Râsan (Arab.); Zanjabil-i-Shâmi (Pers.). Poshkar (Kashmir).

Habitat:—Western Himalaya; on the borders of fields, &c., Kashmir and Piti.

Tall stout herbs, 1-5 ft., stem grooved, scabrid. Leaves scabrid above, densely tomentose beneath, crenate, radical 8-18 by 5-8 in., narrowed into a petiole as long, elliptic-lanceolate; cauline often deeply lobed at the base, oblong, $\frac{1}{2}$ -amplexicaul. Heads many, very large 1 $\frac{1}{2}$ -2 in. diam., racemed. Outer involucre bracts broad, with recurved triangular tips; ligulés

slender, $\frac{1}{2}$ in., inner involucre-bracts linear acute. Achenes $\frac{1}{2}$ in., glabrous, slender; pappus $\frac{1}{2}$ in., reddish.

Uses :—The root of this plant is used in veterinary medicine. The dry roots have a weak, aromatic odour, resembling orris and camphor; their flavor is aromatic and slightly bitter, and their action a mild tonic (Watt).

In Kashmir, it is used to adulterate *Saussurea Lappa*.

Arabian writers recommend it as an expectorant, and as a resolvent in indurations (Honnigberger).

Useful in atonic dyspepsia (Meadows' Prescriber's Companion).

In America, the drug is still resorted to, in the treatment of amenorrhœa, while it is found to be sometimes beneficial in chronic diseases of the lungs, when complications of general debility or want of tone in the digestive organs exist.

They also possess diaphoretic, diuretic, expectorant and emmenagogue properties (Watt).

645. *Pulicaria crispa*, Benth., H.F.B.I., III. 299.

Vern. :—Búi, gidi, sutei, phatmer (Pb.); Burhnâ (H.).

Habitat :—The Punjab and the Upper Gangetic Plain, and eastwards to Behar.

A stout perennial, 1-2ft high, very leafy; shrubby below; branches and leaves beneath densely cottony. Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in. sessile, linear-oblong, or sub-spathulate, margins recurved, toothed, and crisped, lower $\frac{1}{2}$ -amplexicaul. Involucre pubescent, bracts very slender, setaceous, or sub-herbaceous, ligules shorter than the bracts. Pappus white, bearded, thickened at the tips, three times as long as the glabrate achenes, outer scales connate with the hairs, and deciduous with them.

Use :—In the Salt Range, the dried plant is applied as a vulnerary to bruises, &c., of bullocks (Stewart).

646. *Xanthium strumarium*, Linn. H.F.B.I., III. 303.

Syn. :—*X. indicum*, D.C. Roxb. 660.

Sans. :—Aristha.

Vern.:—Chhotâ-gokhru? (Hind.); Bun-okra (Beng.); Shan keshvara; Dhupâ (Bomb.); Marluimulta (Tam.); Veritel-nep (Tel.); Gokhroo, kullan (Sind; Pb.)

Habitat:—Throughout the hotter parts of India, usually near houses; ascending the Western Himalaya to 5,000 ft.

An annual coarse, rough, unarmed herb. Stem short, stout, slightly branched, spotted, harsh with bristly hairs. Leaves petioled, 2-3 in. long, scabrid, triangular-cordate or orbicular lobed and toothed, base cuneate. Heads in terminal and axillary racemes, fruiting involucre $\frac{5}{8}$ in. long, ovoid or oblong, beaks erect or diverging. Achenes enclosed in the hardened involucre cells, ovoid thick; pappus absent.

Use:—The whole plant is supposed to possess powerful diaphoretic and sedative properties. It is generally administered in the form of decoction, and is said to be very efficacious in long standing cases of malarious fever (S. Arjun). Mr. Baden-Powell says that the root is a bitter tonic, useful in cancer and strumous diseases. The prickly fruit considered cooling and demulcent and is given in small-pox (Stewart).

In America and Australia, this plant has been observed to prove fatal to cattle and pigs. Its hairs and prickles are employed as medicine in China (Dymock).

In Southern India, the prickly involucre is applied to the ear, or tied in a bunch to the ear-ring, to cure hemi-crania (Elliott).

“Has proved very useful in urinary diseases, a good diuretic, diminishes the irritability of the bladder. Very useful also in gleet and leucorrhœa, given as infusion or in one drachm doses in powder. Has also been given in menorrhagia (Penny, in Watt's Dictionary).

The fruits are slightly narcotic (Surgeon Mukerji, in Watt's Dictionary.)

647. *Siegesbeckia Orientalis*, Linn. H.F.B.I., III. 304.

Syn.:—*S. brachiata*, Roxb. 605.

Habitat:—Throughout India, ascending to 5,000 ft., in the Himalaya and other mountains.

A large, annual herb, 2-4ft. (Trimen), 1-3ft. (J. D. Hooker), 6-7ft. (Kanjilal), common on damp fallow lands. Stem stiff, erect, with spreading opposite horizontal branches below, and dichotomously branched above, finely pubescent purple. Leaves opposite, 1-5in. long and broad, oval-triangular or short petioles, shortly tapering at base, acuminate, acute, deeply and irregularly laciniate serrate, densely and finely pubescent on both sides, pale, yellowish-green, the uppermost much smaller and nearly entire. Heads $\frac{1}{2}$ in. in diam. small, pedunculate, yellow, subglobose, solitary in the forks of very large lax dichotomous corymbose inflorescence. Involucre-bracts very dissimilar, five outer over $\frac{1}{2}$ in., linear spathulate or club-shaped at end, horizontally spreading, with recurved margins, upper surface set with numerous large, extremely viscous, glandular on back. Ray flower red beneath, very short, recurved, 3-toothed. Achenes each enclosed in a boat-shaped bractlet, glabrous, slightly rough (Trimen); curved, quadrangular, black (Kanjilal).

Uses :—"It has a high reputation as a valuable depurative, and also for its healing properties in gangrenous ulcers and sores. It is strongly recommended in diseases of urethra. ** Dr. Daruty, of Mauritius, writes me that he prescribes it with very good results in the form of an aqueous extract, in syrup and sometimes combined with iodide of potassium, in cases where a powerful alterative, sudorific, and anti-syphilitic is required. He believed it to much more powerful than Sarsaparilla" (Christy's 'New Commercial Plants and Drugs' No. 1X., p. 49, 1886).

Externally, a mixture of equal parts of the tincture and glycerine has been tried in Europe with good effect in ringworm and similar parasitic eruptions. Antiseptic properties have been ascribed to the fresh plant, applied to unhealthy ulcers.

648. *Enhydra fluctuans*, Lour. H.F.B.I., III. 304.

Syn. :—Hingtsha repens, Roxb. 609.

Sans. :—Hilamochikā.

Vern. :—Harhuch (H.); Hingcha (B.)

Habitat :—Eastern Bengal, Assam and Silhet.

A marsh herb, usually quite glabrous, sometimes pubescent or glandular; stems 1-2ft., elongate, simple or divaricating, branches rooting at the nodes. Leaves sessile, linear-oblong, acute or obtuse, entire or subcrenate, 1-3in., variable in breadth, base narrowed or truncate. Heads axillary and terminal sessile, $\frac{1}{3}$ - $\frac{1}{2}$ in. outer dorsally, inner sometimes literally compressed, pappus absent.

Uses.:—The leaves of this aquatic plant are regarded as laxative and useful in diseases of the skin and nervous system. The fresh juice of the leaves, in doses of about a tola, is prescribed by some kavirajas in Calcutta, as an adjunct to tonic metallic medicines, given in neuralgia and other nervous diseases (Dutt).

The leaves are antibilious (K. L. Dey). Expressed juice of the leaves is used as demulcent in cases of gonorrhœa; it is taken mixed with milk, either of cow or goat. The leaves are pounded and made into a paste which is applied cold over the head as a cooling agent (Assistant-Surgeon Mookerji, in Watt's Dictionary).

Useful in the torpidity of the liver. The infusion should be made the previous evening. It is boiled with rice and used with mustared oil and salt; dose infusion, one drachm. (Mr. Forsyth, F.R.C.S., in Watt's Dictionary).

649. *Eclipta alba*, Hassk., H.F.B.I., III. 304.

Syn.:—*E. prostrata*, Roxb. 605.

Sans.:—Kesarāja; also Bhringarāja (K.R.K.).

Vern.:—Moch Kand, Bhangrā, Bābri, Māka, Dodhak (Pb.); Mik (Sind.); Kesuti, Keysuria (B); Karisha langauni, Kaikeshi, Kaivishi-ilai, Kaiantagarie (Tam.); Goontagelinjeroo (Tel.). Bhāugra (U.).

Habitat:—From the Himalaya throughout India.

Hirsute or strigillose annual, erect or diffuse, branched, slender weed. Leaves opposite, sessile, linear or oblong-lanceolate, narrowed at both ends, 1-4in. long, very variable in form and width. Peduncles 1-2, axillary, short or long, and slender. Involucre bracts ovate obtuse, or acute, about equally or exceeding the flowers. Heads $\frac{1}{4}$ - $\frac{1}{3}$ in. diam.

Uses:—In Sanskrit medicine it is principally used as a tonic and deobstruent in hepatic and splenic enlargements, and in various chronic skin diseases. There is a popular opinion that the herb taken internally and applied externally will turn the hair black.

The fresh juice of the leaves is rubbed on the shaven scalp for the purpose of promoting the growth of hair (Dutt).

Mahomedan writers ascribe the same properties to this plant as the Hindus.

In Bombay, the natives use the juice in combination with aromatics, as a tonic and deobstruent, and give 2 drops of it with eight drops of honey to new-born children, suffering from catarrh. The following prescription is used in the Concan for tetanus:—Māka juice, 1 tola; Juice of *Leucas cephalotes* (Tumbā) $\frac{1}{4}$ tola; Ginger juice, 2 tolas; Juice of *Vitex trifolia*, 1 tola; and leaf-juice of *Sesbania grandiflora*, 3 tolas: to be boiled with four times the quantity of cocoanut juice and a little rice and treacle to form a *khir*, to be given twice a day. (Dymock).

In the Gujrat district of the Punjab, it is used externally for ulcers, and an antiseptic for wounds in cattle (Ibbetson's Gujrat: p. 11.)

The Indian Pharmacopœia recommends the expressed juice as the best form of administration in hepatic derangements, as a substitute for taraxacum.

The fresh plant is applied with sesamum oil in elephantiasis, and the expressed juice in affections of the liver and dropsy. When used in large doses, it acts as an emetic. It is also considered cooling (Watt).

It is anodyne and absorbent, and relieves headache when applied with a little oil. It is an excellent substitute for taraxacum (Kannye Lal De Bahadur).

In Chutia Nagpur, the root is applied in conjunctivitis and galled necks in cattle (Revd. A. Campbell).

The juice of the leaves is given in one teaspoonful doses in jaundice and fevers. The root is given to relieve the scalding

of the urine in doses of 180 grains mixed with salt (Dr. Peters, in Watt's Dictionary).

650. *Wedelia calendulacea*, Lees. H.F.B.I., III 306.

Syn.:—*Verbesina calendulacea*, Linn; Roxb. 606.

Sans.:—Pita-bhringi; Bhringarāja.

Vern.:—Bangra, Kesaraja (B.); Bhānra (H); Pivalā bhāngra (Bomb.); Pivalāmākā (Mar.).

Habitat:—In wet places, Assam, Silhet, and the Eastern and Western Peninsulas.

A scentless, tasteless perennial herb. Stem short, 6-18in., procumbent at base and rooting at the nodes, then ascending, cylindrical, slightly rough, with adpressed hair. Leaves 1-3in., variable in breadth, opposite, nearly sessile, oblong, strap-shaped, or oblong-oval, tapering to base, acute, sparingly and shallowly serrate or entire, slightly rough with adpressed, rigid, white hair on both sides. Heads yellow, solitary, few, on very long, erect axillary (apparently terminal) peduncles, about $\frac{1}{4}$ in. diam. Bracts few, 5-8, $\frac{3}{8}$ in., leafy oblong, obtuse, inner 2 or 3 much smaller. Receptacle flat, with a linear, acute, hyaline, ciliate bractlet to each flower. Ray-flowers 8-12, spreading, about equalling bracts, broad, deeply 2-3ft. toothed; disk-flowers about 20, short, narrowed acute, recurved. Achene nearly cylindric, pubescent, shorter than bractlet, crowned with a shallow ring of short, scarious, ciliate scales (Trimen).

Uses:—The leaves are used in dyeing grey hair and in promoting the growth of hair. They are considered tonic, alterative and useful in cough, cephalalgia, skin diseases and alopecia. The juice of the leaves is much used as a snuff in cephalalgia. (Dutt). The seeds, flowers, as well as the leaves, are used in decoction, in the quantity of half a teacupful twice daily, as deobstruent (Ainslie).

In decoction, the plant is used in uterine hæmorrhage and menorrhagia (S. Arjun).

651. *Spilanthes Acmella*, Linn., H.F.B.I., III 307.

Habitat:—Throughout India.

An annual herb, more or less pubescent, sometimes hairy. Stems prostrate near the base or ascending, 1-2ft., much branched, cylindric, more or less hairy. Leaves opposite, $\frac{3}{4}$ -1 $\frac{1}{2}$ in., ovate, ovate-lanceolate, suddenly tapering at base, acute, faintly and irregularly serrate, glabrous or nearly so, thin, somewhat 3-nerved; petiole long, slender pilose. Heads apparently terminal, really axillary on long glabrous peduncles, ovate ovoid, bracts leafy, lanceolate, subacute; discoid or radial, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, solitary. Receptacle narrowly conical, or covered with concave scales, each enclosing the lower part of the flower. Flowers yellow (or white, Collett), mostly 2-sexual, or the outer female, and shortly rayed. Pappus none, 1 or 2 bristles. Corolla bell-shaped, tube, short, lobes triangular, 4, spreading. Achenes flattened, oblong, dark-brown, dull, each enclosed in a scale.

Uses:—The flower-heads are by far the most pungent part, and are chewed by the natives to relieve toothache, which they do by producing redness of the gums and salivation. Dr. W. Farquhar has used and recommended a tincture of the flower-heads for toothache, in place of tincture of pyrethrum. He says it is a specific for inflammation of the periosteum of the jaws. A bit of lint, dipped in the tincture and laid on the gums, repeated 3 or 4 times a day, has a speedy effect in reducing the pain and swelling (Pharmacographia Indica, Vol. II. p. 283).

652. *S. oleracea*, Jacq. H.F.B.I., III. 307; ROXB.

(Reduced to a variety of *S. Acmella*. Linn, Fl. Br. Ind.) p. 307, Vol. III by D. Hooker.

Vern.:—Akarâ (Bomb.); Roshuniya (B.); Akarkarhâ, Pokurmûl (Pb.); Ukrâ (M.) Marâtimogga, Marâtitige (Tel.).

Habitat:—Cultivated in gardens throughout India.

With regard to variety, *Oleracea* Clarke, J. D. Hooker remarks thus:—"More robust and succulent, heads and leaves larger, peduncles subsolitary, achenes as in variety *Acmella*

proper, that is, "margined, scabrid, pappus usually of 1-2 bristles."

Uses :—The whole plant is very acrid, but the flower-heads are especially so, having a hot, burning taste, which causes profuse salivation. It is on this account that the plant has been named Akalkhura by the gardeners. This is a popular remedy for children who stammer. The flower-heads are sometimes chewed to relieve toothache (Dymock).

It is considered by the natives a powerful stimulant and sialogogue, and is used in headaches, paralysis of the tongue, affections of the throat and gums, and for tooth-ache.

Pyrethrin is obtained from this plant. It is resolved by alcoholic potash into pyrethric acid and piperidine.

653. *Guizotia abyssinica*, Cass. H.F.B.I., III. 308.

Syn. :—*Verbesina sativa*, Roxb. 606.

Habitat :—A native of Tropical Africa, cultivated in various parts of India.

Vern. :—Râmtil; Kâlâtil (H. B. and Bomb.); Valesulû (Tel); Karmadoo (Mysore).

A stout, erect annual, smooth or scabrid, pubescent upwards. Leaves 3-5 in., sessile, half-amplexicaul, linear, ovate-lanceolate, lanceolate-oblong, or subcordate, serrate, obtuse. Heads $\frac{1}{2}$ -1 in. diam., peduncles naked, 1-2 in. Involucral bracts 5; outer broadly elliptic or ovate, obtuse, green; ligules few, broad. Achenes dorsally pressed, glabrous, tip rounded, yielding a bland oil.

Use :—The oil is sweet, and may be used for the same pharmaceutical purposes as sesamum oil (Dymock).

The achenes contain from 40 to 45 per cent. of a yellow sweet oil. According to Leather seeds from cultivated Indian plants yield on an average 40 per cent. of oil. The oil is used in soap-making and as a substitute for linseed oil; in India it is occasionally employed as a substitute for ghee.

Crossley and Le Sueur in 1898 examined four samples of East Indian oil: Specific gravity at 15.5°, 0.9248–0.9263; solidifies below zero; saponification value, 188.9–192.2; iodine value, 126.6–133.8; Reichert-Meissl value, 0.11–0.63; Maumené test, 81°; butyro refractometer, 63° at 40°. Fatty acids and unsaponifiable, per cent. 94.11; iodine value, 147.5. The oil has slight siccativ powers and gained 7.2 per cent. in weight in fifteen days.

654. *Glossocordia linearifolia*, Cass. H.F.B.I., III. 308.

Syn. :—*Verbesina Boswellia*, Roxb. 607.

Sans. :—Pithari.

Vern. :—Phatara-suva (Bomb.); Pitta-pâpadâ (Poona); Seri (H.); Para palavum (Tel.).

Habitat :—Rohilkhund; at Delhi; Banda; Central India and the Deccan.

An annual herb, prostrate or erect, glabrous, diffusely branched from the base. Branches 3-10 in., long, strict or flexuous. Leaves $\frac{1}{2}$ -2 in., 2-pinnatisect, petiole, long slender, blade broadly ovate in outline, segments filiform. Heads $\frac{1}{2}$ in. long, shortly peduncled; outer involucre bracts small, usually 3, with a greenish midrib and membranous ciliate margins; inner involucre bracts large, obtuse, with a striated disk glabrous, and with pale membranous margins. Achenes $\frac{1}{2}$ in. long, odour of fennel, densely bearded especially on the edges with stiff hairs. Pappus awns spreading.

Use :—According to Dalzell and Gibson it is much used in female complaints (Dymock).

655. *Glossogyne pinnatifida*, DC. H.F.B.I., III. 310; Roxb. 604.

Vern. :—Barangone bir barangone (Santal).

Habitat :—Plains of India, from Jammu and Garhwal to western Bengal and Behar, and southwards to Madras.

Perennial, glabrous herbs. Root fusiform, woody. Stems usually many from the root, erect or ascending, 6-18 in. high. Branches slender, forked. Leaves mostly radical, pinnatifid, triangular in outline, segments linear acute, few, often recurved, coriaceous; petiole 1-2 in.; veins prominent beneath. Flowering branches 6-12 in., strict, stiff, grooved, nearly leafless. Heads in flower $\frac{1}{2}$ in. diam. Involucre-bracts linear, obtuse, glabrous, $\frac{1}{2}$ in. long. Achenes $\frac{1}{4}$ - $\frac{1}{2}$ in., deeply grooved, black.

Use :—A preparation from the root is employed by the Santals as an application to snake-bite and scorpion-sting (Rev. A Campbell).

656. *Achillea millefolium* Linn. H.F.B.I., III.
312.

Syn. :—*A. cuspidata*, DC. Wall. Cat. 32-30.

Vern. :—Rojamari (Bomb.); Biranjasif (Cutch); Stewart says that this is one of the plants sold in the Bazars under the names *Momâdru chopândiga* (Kashmir); Bui Mâderan (Afghanistan).

Eng. :—Milfoil or common Yarrow. The older English writers called this plant Nose-bleed, because the leaves, if inserted into the nostrils, were supposed to cause bleeding. Sold in Bombay as Rosemary.

Habitat :—Western Himalaya, from Kashmir to Kumaon; alt. 6-9,000 feet.

An erect, pubescent herb. Root stoloniferous. Stems 6-24 in., furrowed, leafy. Leaves alternate, narrowly oblong-lanceolate, 3 pinnatisect, 2-4 by $\frac{1}{4}$ - $\frac{1}{2}$ in.; radical leaves petioled, segments close set, acute; upper leaves sessile. Heads many, radiate, $\frac{1}{2}$ in. diam., crowded in compound corymbs. Involucre bracts few, erect; outer ones shorter; receptacle flat, covered with thin, oblong scales, nearly as long as the flowers. Flowers white or pale-pink. Pappus none; 5-lobed. Achenes oblong, flattened shining.

Parts used :—Leaves and flower-heads.

Uses :—In Scotland at the present day, a warm decoction of the fresh leaves is regarded as a family specific against the colds and other ailments common to childhood.

This plant once held a creditable position amongst British drugs, and its recent introduction into the American Pharmacopœia may have the effect of reviving its use in England. It might, with great advantage, be added to our list of Indian indigenous drugs. Formerly, it was much used in England as a "vulnerary, and was given internally for the suppression of hæmorrhages and of profuse mucous discharges. It was employed also in intermittents and as an antispasmodic in flatulent colic and nervous affections. Its hot infusion is used as an emmenagogue in France, and also in the suppression of the lochia; it is sometimes employed in low exanthematous fevers

with difficult eruption. In these cases, it probably acts as a stimulant sudorific, as do most aromatic herbs (U. S. Dispensatory, Ed. 15th, 1560.) It is Carminative.

"It was formerly much esteemed as a vulnerary, and its old names of 'soldiers wound-wort' and 'knight's milfoil' bear witness to this. The Highlanders still make an ointment from it, which they apply to wounds, and Professor Bromel states that milfoil-tea is held in much repute in the Orkney Islands for dispelling melancholy!

"One of its common names among country people is 'nose-bleed'; for the leaf being rolled up and applied to the nostrils causes a bleeding at the nose more or less copious. It is also called 'old man's pepper,' on account of the pungency of its foliage."—Sowerby's Eng. Bot. v. pp. 57-58.

From the whole plant, are obtained :—

- (A) A glucoside named **Achillein**, $C_{20} H_{33} N_2 O_{15}$. It is amorphous, reddish brown, bitter, alkaline; soluble in water easily (giving yellow solution), in alcohol with difficulty. Insoluble in ether. With boiling dilute acids, is converted into sugar and **Achilletin**, $C_{11} H_{17} NO_4$, which is an amorphous, dark brown powder, not bitter, insoluble in water, and with difficulty in alcohol.
- (B) A bitter principle named **Ivain**, $C_8 H_{14} O$ or $C_{24} H_{42} O_3$. It is yellow in color, amorphous, soft resinous ('Terebinthinate'), bitter, soluble in alcohol, not in water.
- (C) An alkaloid, **Moschatine**, $C_{21} H_{27} NO_7$. It is bitter in taste, reddish-brown in color, and amorphous in appearance, melts under water (on water bath). Soluble with difficulty in alcohol, scarcely in water.

Sohn says :—

Achillein gives no precipitate with caustic alkalies, lead acetic, tannic acid or ferrous sulphate.

657. *Chrysanthemum indicum*, Linn. H.F.K.I., III. 314; Roxb.

Vern. :—Gul-daoodi (H.); this name applied to all the varieties (Roxburgh). Chamimti (Tel.); Tjettipu (Mal.); Gendi, bágaur (Pb.); Chandra-mallika (B.); Kalzang (Ladak).

It would appear that this and *C. Coronarium*, L. are not distinguished from each other by the natives of India, and the native names apply to both. (Watt.)

Habitat :—Cultivated in Indian gardens.

There are several varieties, with flowers of various colours, such as yellow, golden, orange, purple, lilac; buds crimson, white, changeable into rose-colour. Spanish brown.

A procumbent diffuse annual. Stems rigid, 4-angular, grooved, glabrous or scabrid. Leaves long petioled, 1-3 in.

long, deltoid in outline; segments oblong or cuneiform, obtusely lobed or cut, with a mucro at the apex of each ultimate division, translucent, succulent; petioles dilated towards their sheathing bases, the margins membranous. Heads $\frac{1}{2}$ in diam., enlarging in fruit. Invol-bracts equalling the achenes, oblong or elliptic, obtuse, strongly nerved and with rather broad membranous margins. Achenes $\frac{1}{10}$ in. long, cuneate oblong, obcompressed, grooved, the margins very thick (Duthie).

Flowers in the cold season. Roxburgh names the plant *C. Indicum* after Willdenow. The purple chrysanthemum plate was published under No. 327 by Curtism in Feb. 1796, as the *Chrysanthemum Indicum* of Linnæus; subsequently, in Feb. 1810, Curtis published a plate *Chrysanthemum indicum*, B, changeable white Indian Chrysanthemum under name of Willdenow, with a huge bunch of rosy flowers in the central part of the flower-head. The writer in the letter-press has the following observations:—"Willdenow has supposed that the chrysanthemum of Linnæus is not the same species with our plant, but we see no reason to disbelieve that they are distinct." It must not be forgotten that some colours are liable to be modified from change of soil, situation, climate or season.—

K. R. K.

Use:—This plant is considered by the natives heating and aperient, useful in affections of brain and calculus, and to remove depression of spirits (Punjab Products). The natives of the Deccan, administer the plant in conjunction with black pepper, in gonorrhœa (Drury).

658. *C. coronarium*, Linn. H.F.B.I., III. 314.

Syn.:—*C. Roxburghii*, Desf.; *Pyrethrum indicum*, Roxb. 604.

Sans.:—Shevantikâ.

Vern.:—Gul-chîni (H. and Dec.); Gul-dâudi (B.); Shamantip-pu (Tam.); Châmanti (Tel.); Seoti (Bomb.)

The garden Daisy.

Habitat:—Cultivated in the Indian gardens.

Annual herb. Stems branched, 3-4ft. high. Leaves alternate, deeply lobed in a bipinnate manner. Flower-heads numerous,

yellow, 2in. across, solitary, or in corymbs. The Ray-florets are in one series only, strapshaped, yellow or white, and all female; those of the disk are tubular, with four or five teeth at the mouth, and bisexual; the pappus is reduced to a membranous ring or absent altogether. There is called a "double" variety, with the florets all strapshaped, closely overlapping. Bracts, with dry and translucent margins (Page 290, vol. II, the Favourite Flowers of Garden and Green-house, by Edward Step, F. L. S. Frederick Warne and Co.).

Use:—Dallzell and Gibson state that the flowers are a tolerable substitute for chamomile. The root chewed communicates the same tingling sensation to the tongue as pellitory. According to Dr. Walker (Bombay Med. and Phys. Trans. 1840, p. 71), the people of the Deccan administer the plant in conjunction with black pepper in gonorrhœa (Ph. Ind.).

559. *Matricaria Chamomilla*, Linn. H.F.B.I.,
III. 315.

Syn.:—*M. Suaveolens*, Linn. Roxb. 605.

Vern.:—Babun phul (B. and H.); Bâbunah, Suteigul (Pb.).

Habitat:—Upper Gangetic Plain and the Punjab.

An aromatic herb, about 1-ft. high; much-branched. Leaves 2-pinnatifid, segments very narrow. Heads $\frac{1}{2}$ - $\frac{3}{4}$ in. diam., corymbose. Ligules reflexed after flowering, or O; receptacle elongating during fruiting. Achenes grey, small; ribs slender, white, ventral only. Achenes with slender white ribs on the ventral face only. Pappus O.

Use:—In Persian works, the flowers are described as stimulant, attenuant and discutient. There is a popular opinion among the Persians that the odour of the flowers induces sleep and drives noxious insects; they also say that Chamomile tea applied to the genitals has a powerfully stimulating effect (Dy-mock).

Chamomile oil is used externally in rheumatism, in Gujrat (Ibbetson's Gazetteer).

The dried flower-heads are officinal, and are said to be stimulant, tonic and carminative. They are used in constitutional debility, hysteria, dyspepsia and intermittent fevers. The warm and strong infusion of the flowers is emetic, while a weak infusion acts as a tonic and febrifuge. In flatulence and colic, Chamomile oil is the most effectual of all remedies. The Indian Pharmacopœia says, the *babuna ka phul* forms a perfect substitute for the European Chamomile (*Anthemis nobilis*).

Analysis by Frederick B. Power and Henry Browning, Jr. of Wellcome Chem. Res. Labs, published in the Journal Chem. Soc. for 1914.

Tests for alkaloids were almost negative.

It contains a blue essential oil, giving color reaction for furfural, and depositing, on keeping, probably umbelliferone Me ether. It also contains a resin.

660. *Cotula anthemoides*, Linn. H.F.B.I., III.
316.

Vern. :—Babunâ (Pb. and H.); Tulobe (Cashmere).

Habitat :—Gangetic Plain, from Rajmahal and Sikkim westwards to the Punjab.

An annual hairy, or glabrate, erect or diffuse, weak weed. Branches 3-9in., spreading. Leaves 2-pinnatifid or 2 pinnatisect, segments decurrent-lobed, lobes triangular lanceolate, $\frac{1}{8}$ - $\frac{3}{4}$ in. Petiole $\frac{1}{2}$ amplexicaul. Peduncles filiform, naked. Heads $\frac{1}{8}$ - $\frac{1}{2}$ in. diam., terminal, solitary. Flowers female, many. Involucre bracts, with scarious margins. Receptacle nearly flat, tubercled. Achenes ovate, with thick narrow wings. Achenes of the ray broad, flat.

Use :—It furnishes part of the officinal *babuna*, which is heated with oil and applied externally in rheumatism, &c. (Stewart.) The infusion is used as an eye, wash in most diseases of the eye.

661. *Centipeda orbicularis*, Lour. H.B.F.I., III.
317.

Syn. :—Myriogyne minuta, Lees., Artemesia sternutatoria, Roxb.

Vern. :—Nakk-chhikni; Nag-downa; Pachittie (H B. and

Bom.); Mechitta (B.); Nakasinkani, shikani (Mar.); Afkur (Sind). Bedi Achim (Santal).

Habitat:—Throughout the plains of India.

Annual, prostrate, glabrous or sparsely woolly herb. Stems excessively numerous, spreading from the root, 4-8 in. long, slender, leafy. Leaves ovate-oblong, spathulate, $\frac{1}{2}$ - $\frac{1}{4}$ in. long; teeth sharp, 2 on each side. Heads solitary, globose, axillary $\frac{1}{10}$ - $\frac{1}{8}$ in. diam., subsessile. Corolla of female flower a very minute cylindric tube, hairs of achenes simple. Achenes minute, tipped with persistent style, bristly on the angles, says Trimen.

Uses:—The minute seeds are used as a sternutatory by the Hindus, also the powdered herb. It is administered in ozæna, head-aches, and colds in the head (Dymock). Boiled to a paste and applied to the cheeks, it is employed in the cure of tooth-ache (Stewart).

Used for hemicrania (Surg.-Maj. Robb, in Watt's Dictionary II).

The natives of India consider it a hot and dry medicine, useful in paralysis, pains in joints, and special diseases; also as a vermifuge ('Cyclop of India').

Called "Sneezeweed" in southern New South Wales.

The following letter from the Rev. Dr. Wools (then of Richmond, N. S. W.), to the Editor of the *Sidney Morning Herald*, appeared in that journal on Christmas Day, 1886. It is given in full, as if the plant only partially realizes the expectations formed of it. It will be a valuable addition to our indigenous vegetable materia medica.

"Some weeks since the Rev. S. G. Fielding, of Wellington, called my attention to a weed (known to botanists *Myriogone minuta* of the Composite Order, which he said had been used with success in cases of blight. Being anxious to test the efficacy of the remedy, and to ascertain whether any bad effects would arise from its application, I placed some of it in the hands of Dr. Jockel of this town, who had furnished me with the following remarks:—'I have much pleasure in testifying to the efficacy, in cases of ophthalmia, of the plant which you so kindly sent me. A case came under my notice a few days ago of a drover who was suffering from a severe form of purulent ophthalmia, contracted up the country. I made an infusion of the plant according to the directions, and the first local application seemed to have almost a magical effect. The man expressed himself as relieved at once of the intense smarting which he had previously suffered. He got on so well that in two days he was

able to start back up country again, and could hardly express his gratitude for the very great relief afforded."—Louis C. Joekel.

"I find from a communication of Baron Mueller, that for some time past he has had an idea that *Myriogyne* might be used for medicinal purposes, and that he had actually submitted it to Dr. Springthorpe, an eminent physician in Melbourne, for purposes of experiment. The Baron, however, was not aware of its efficiency in simple ophthalmic inflammation, and he regarded the discovery as interesting. I mention this as a matter of justice to Dr. Joekel, who, I believe, is the first medical man in Australia who has proved the value of *Myriogyne*, in a case of ophthalmia. This weed, growing as it does on the banks of rivers and creeks, and in moist places, is common to all the Australian colonies and Tasmania, and it may be regarded as almost co-extensive with the disease which it is intended to relieve. In the document relating to the Inter-Colonial Exhibition of 1886-7, it is noticed as remarkable for its sternutatory properties, and recommended for the manufacture of snuff."

The Rev. Mr. Hartmann says (Brough-Smyth's 'Aborigines of Victoria,' ii., 173) that this plant is used as medicine by the aborigines of Lake Hindmarsh, but he does not say for what complaint.

Baron Mueller prepared a snuff from this plant many years ago (J. H. Maiden, F. L. S., &c., Ph. J. Sept. 1, 1888, p. 178-179).

662. *Artemesia scoparia*, Waldst and Kit. H.F.B.I., III. 323.

Syn.:—*A. elegans*, Roxb., 599.

Vern.:—Jhan, lasaj, biur, durumga, donâ, marûa, pila jan, king khak durunga (Pb.). Churi saroj; Danti (Bâzar name).

Habitat:—Upper Gangetic Plain and westwards to Scind and the Punjab, Western Himalaya, from Kashmir to Lahaul.

A faintly scented, very slender-branched, glabrous or pubescent annual or perennial herb, 1-2ft., (or 3-6ft. *Duthie*) high. Stems slender, grooved, usually tinged with purple; branchlet often almost capillary, glabrous below, hoary or villous. Radical leaves 1-3in. long, petioled, broadly ovate, 1-3-pinnatisect, segments linear, distant, spreading; cauline leaves filiform or setaceous. Heads sessile, or on short capillary pedicels, minute, $\frac{1}{12}$ - $\frac{1}{10}$ in., secund in slender, paniced racemes, involucre-bracts glistening oblong, obtuse scarious, with narrow green disks. Outer female flowers fertile, inner hermaphrodite flowers sterile and with larger corollas. Achenes $\frac{1}{80}$ in. long ("perhaps,"

says J. D. Hooker, "one of the most minute fruits of any flowering plants"). Further, says Hooker, though usually described as annual, some specimens both from the plains of India and Tibet have woody stocks.

Use:—The branches appear to be officinal in the Punjab. The smoke is considered good for burns, and the infusion is given as a purgative (Stewart).

663. *A. maritima*, Linn. H.F.B.I., III. 323.

Vern.:—Kiramâni owa (Bomb.); Tarkh (Pushtoo).

Arab. and Pers.:—Sheeh; Sariqun; Afsantin-ul-bahr.

Habitat:—Western Himalaya, from Kashmir to Kumaon.

Hoary or tomentose, shrubby below. Rootstocks woody, branched, stems erect or ascending, much branched from the bases. 6-18in., strict, woody or wiry. Leaves ovate, 2-pinnatisect; $\frac{1}{2}$ -2in., often quite white, with very many segments; segments small, spreading, linear obtuse; upper simple linear. Heads 3-8 fid. ovoid or oblong suberect in spicate fascicles, often, reddish, crowded and bracteolate by a small linear or almost setaceous leaf. Bracts linear oblong, outer herbaceous tomentose, inner scarious, acute, glabrous.

Use:—In Bombay, the Hakims prescribe it in doses of 2 to 3 derhems as an anthelmintic, and also deobstruent and stomachic tonic. In the form of a poultice, they use it to relieve the pain caused by the bites of scorpions and other venomous reptiles (Dymock).

"Useful in gleet" (Surg. Masani in Watt's Dict., Vol. 1).

Officinal in both Indian and British Pharmacopœias; used as an anthelmintic. According to Dr. Von Schröder, it is not poisonous to ascarides as was formerly thought, but merely drives them to the large intestine whence they can be removed.

It is indigenous to Southern Afghanistan and Baluchistan, and is much used as an antiperiodic. An infusion (and also decoction, of the fresh plant has been very successfully used

by me in cases of ague, intermittent and remittent fever. It is a very useful febrifuge and deserves trial (B. D. Basu).

Church reported on a bundle of dry leaves received at Kew from Duthie. The following is his analysis:—

Percentage composition of *Artemisia maritima*:—

Water	...	...	...	...	13.6
Oil, resin, wax, etc.	...	...	...	...	4.0
Starch, sugar, gum, etc. (by difference)	...	...	...	...	34.2
Albuminoids (true)	...	...	...	...	6.0
Fibre	...	...	...	...	33.9
Ash (includes 2.7 of sand and mica)	...	...	...	...	8.3

Church remarks that the plant contains rather less albuminoids, less digestible carbohydrates, and more fibre than the average hay of mixed grasses. It is, however, thrice as rich in albuminoids as the straw of European cereals.

Artemisin, $C_{15}H_{18}O_4$, is obtained from the last mother liquors in the technical treatment of the seed of *Artemisia maritima*. It is freed from santonin by recrystallisation from chloroform, being deposited in combination with 1 mol. of the solvent, which is evolved at 90° . It melts at 200° , gradually turns yellow in the air, and is more readily soluble in water and dilute alcohol than santonin; $[\alpha]_D = -84.3^\circ$. The ferric chloride reaction is not characteristic; when heated with soda (10 parts) and water (40 parts), a fugitive carmine-red coloration is produced, and, like santonin, it gives the same colour with alcoholic soda. Artemisin is apparently hydroxy santonin.—J. Ch. S. LXX, pt. I. (1896) p. 59.

Max Jaffé, considers artemisin as γ -hydroxysantonin.

664. *A. vulgaris*, Linn. H.F.B.I., III. 325; Roxb. 599.

Syn.:—*A. indica*, Willd.; *A. paniculata*, Roxb. 598.

Sans.:—Nâgdami, granthiparni.

Vern.:—Nâgdounâ, mâtjari, mastaru, dona (H.); Sarmi, Samri (Dehra Dun), Nâgdonâ (B.); Tataur, pûnjan, banjiru, chambrâ, ûbûsha, tarkhâ; Bui mâdarân, afsuntin (Pb. Bâzar names); Surband (Mar.); Titapat (Nepal)

“In Madras, the native names are applied to two sections:—

(a) *A. vulgaris*:—Dounâ (H and Duk.); Mar-i-Kurundu (Tam.); Davanamu (Sans. Tel. Kan.); Davanâ (Mar.).

(b) *A. indica*:—Mâspatri (D.); Machi-pattri (Tam. Tel. Mal. and Kan.); Granthaparni (San.)—Dr. Moodeen Sheriff.

Habitat:—Throughout the mountainous districts of India; on the west Himālaya, Khasia Hills, Manipur; mt. Aboo, in Mārwar, and the Western Ghâts.

A tall aromatic shrub-like herb, 2-8 ft. high, hoary pubescent or tomentose. Stems leafy paniculately branched. Lower leaves petioled, 2-4 in. long, ovate in outline, 1-2 pinnatisect, with stipule-like lobes at the base, more or less pubescent above, ashy-grey or white tomentose beneath; upper leaves often sessile, linear-lanceolate, entire or 3-fid. Heads sessile or shortly pedicelled, ovoid or subglobose, arranged in sub-secund spike-like suberect or horizontal paniced racemes, brownish-yellow. Invol-bracts woolly or glabrate; outer small, herbaceous, inner mostly scarious. Outer fem. flowers very slender; inner hermaphrodite flowers fertile. Achenes minute. The Dehra Dun plant belongs to the form known as *A. indica*, which has the lower surface of the leaves of an ashy-grey colour. (Duthie).

Uses:—The Hindus consider it to be a valuable stomachic, deobstruent, and antispasmodic; they prescribe it in infusion and electuary, in cases of obstructed menses and hysteria. Externally, it is used in fomentations, given in skin diseases and foul ulcers as an alterative (Dutt).

Used as a tonic, anthelmintic, antispasmodic and expectorant, in diseases of children. Expressed juice is applied by native practitioners to the head of young children, for the prevention of convulsions (Watt's Dictionary, Vol. I).

"Used by the natives in asthma and diseases of the brain also" (London Exhibition).

Bellew states that in Afghanistan and throughout India, a strong decoction is given as a vermifuge, and a weak one to children in measles. An infusion is given as a tonic.

"The strong aromatic odor and bitter taste of this plant indicate stomachic and tonic properties. Dr. Wight states that the leaves and tops are administered in nervous and spasmodic affections connected with debility, and also that an infusion of them is used as a fomentation in phagedenic ulceration. Dr. L.

Stewart describes an infusion of the tops and leaves as a good, mild stomachic tonic" (Ph. Ind.).

Said to be used in China in the preparation of an external application (*moxa*) employed in relieving pain.

665. *A. sacrorum*, *Ledeb.* H.F.B.I., III. 326.

Vern. :—Tatwen, munyû, niurtsi, jan, chûmbar, zbior, burnak (Ph.).

Habitat :—Kunâwur, and the Tibetan region of Kumaon.

An erect, hoary perennial, shrubby below, leaves long petioled, ovate, pinnatisect, segments pectinately pinnatifid, hoary or green, or white pubescent, on both surfaces. Rachis simple or pectinately winged. Heads 15-20-fid, broadly hemispheric, nodding subsecund distant in slender paniced racemes. Involucre-bracts hoary, outer, with a green disk and broad scarious margins, linear, green.

Use :—Said to be given medicinally to horses in affections of the head (Stewart).

666. *A. persica*, *Boiss.*, H.F.B.I., III. 327.

Vern. :—Shih ; Sariqûn ; Afsantin-ul-Bahar (Arab. and Pers.); Pardesi da wano (Guz.) ; Dawânâ (Mar.).

Habitat :—Afghanistan ; also Western Tibet.

A tall, erect perennial or biennial, hoary, with white tomentum. Stem 3-4ft., grooved or ribbed. Branches long, suberect. Leaves small, ovate, or flabellate decompondly, very finely pinnatisect, sessile or petioled. Segments minute, linear or lobulate. Heads numerous, $\frac{1}{8}$ in. diam., yellow, subglobose, rather remote, pedicelled, secund nodding, in short, or long axillary strict, erect racemes. Involucre-bract tomentose, outer linear green, inner orbicular broadly scarious. Receptacle small, convex of hermaphrodite flowers almost cupular, glabrous or pubescent.

Use :—Bellew states that the plant is used as a tonic, febrifuge and vermifuge.

667. *A. Absinthium*, Linn. H.F.B.I., III. 328.

Syn.:—*Absinthium vulgare*, Gærtn.; *A. officinale*, Lam.

Eng. names:—The absinthe; Wormwood.

Vernacular:—Vilāyati-afsantin (H. and Duk.)

Habitat:—Kashmir.

A perennial, hoary, silky, pubescent, herbaceous plant, very aromatic. Stem erect, angular, ribbed, 1-3ft. Leaves ovate or obovate, 1-2in., unequally, 2-3 pinnatifidly, cut into spreading linear or lanceolate, obtuse; segments hoary on both surfaces; radical and lower cauline narrowed into winged petioles. Heads $\frac{1}{2}$ - $\frac{1}{4}$ in. diam., numerous, but hardly crowded. Flowers yellow, pedicelled, hemispheric in drooping, secund racemes terminating in branches. Ray-corolla dilated below. Outer Involucre-bracts oblong, hoary, narrowly scarious. Receptacle hairs long, straight. Anthers acuminate (not aristate). Achenes elliptic oblong, or somewhat obovoid, $\frac{1}{2}$ in. long.

Part used:—The whole herb, in the form of decoction, infusion and poultice.

Uses:—The whole herb is an aromatic tonic, and formerly enjoyed a high reputation in debility of the digestive organs. It was also regarded as an anthelmintic. Before the discovery of Cinchona, it was largely used in intermittents. It exercises a powerful influence over the nervous system, and its tendency to produce headache and other nervous disorders is well known by travellers in Kashmir and Ladāk, who suffer severely when marching through the extensive tracts of country covered with this plant (Watt's Dictionary, Vol. I., p. 324). Prescribed in the form of a poultice or formentation as an antiseptic and discutient.

It yields by distillation a dark green or yellow oil, having a strong odour of the plant and an acrid taste. In large doses it is a violent narcotic poison.

It contains a compound *anabsinthin*, $C_{13}H_{24}O_4$, soluble in alcohol, benzene, and chloroform, but only slightly soluble in water; this forms long, white, prismatic needles, which, when dried at 120°, melt at 258–259°; from acetone, it separates in large and peculiar crystals. With sulphuric acid, it gives a

violet red coloration that changes to blue, and with dilute hydrochloric acid (1 : 5), it gives a brown coloration and shows a slight green fluorescence when water is added. Acetic anhydride converts anabsinthin into a resin, but oxidising and reducing agents, and dilute acids and alkalis, have but little action on it. It does not reduce Fehling's solution, and yields no compound with phenylhydrazine. When distilled, it yields acetic and formic acids and an oil which becomes green and blue when exposed to air. Anabsinthin is quite distinct from the absinthin of Senger and of Bourcet.—(J. Ch. S. 1899 AI 377).

Absinthin is obtained from the leaves. When pure, this glucoside crystallises from dilute alcohol, in prismatic needles, melts at 68°, and has an extremely bitter taste. Senger's formula for absinthin is $C_{13}H_{20}O_4$.—J. Ch. S. 1899 AI 538.

668. *A. Sieversiana*, Willd. H.F.B.I., III. 329.

Vern :—Afsantin ; Downâ (Pers. and Arab.).

Habitat :—Western Himalaya, from Kashmir to Lahaul.

Very similar in many respects to *A. Absinthium* Linn., but annual (in the Indian specimens), with much larger heads, distant on the long, lax racemes, and the anthers aristate. Hoary, pubescent, stems erect, angled, ribbed, simple or paniculately branched above. Leaves mostly petioled, broadly ovate, 2-pinnatisect, segments obtuse and obscurely lobed, hoary on both surfaces. Heads $\frac{1}{4}$ - $\frac{1}{2}$ in., diam. broadly hemispheric, pedicelled, secund nodding distant, in lax long racemes, terminating in branches. Outer Involucre-bracts green, hoary, inner Involucre-bracts broadly scarious. Receptacle hairs long, straight.

Uses :—Medicinally, it is esteemed as a tonic, deobstruent, febrifuge, and anthelmintic, and it is applied externally as a discutient and antiseptic. The Hakims prescribe it in hypochondriasis, jaundice, dropsy, gout, scurvy, &c. ; also as an emmenagogue, and in hysterical affections (Dymock).

669. *Tussilago, Farfara*, Linn. H.F.B.I., III. 330.

Vern. :—Watpan (Pb.).

Habitat :—Western Himalaya, from Kashmir to Kumaon.

A white, woolly, a scapigerous herb, with a perennial root-stock. Leaves long-petioled, all radical, coming after the flowers, orbicular, cordate, toothed, 3-10 in. broad, cobwebby above, white

tomentose beneath. Scapes 1, or more, 4-10in., tomentose; bright yellow, drooping in bud, 1-1½ in. Flowers, female, multiseriate, fertile ligule narrow, spreading. Disk-flowers hermaphrodite, sterile, tubular, limb-elongate 5-fid. Involucre campanulate or cylindric; bracts 1-seriate, equal, with a few very small outer ones. Receptacle flat, naked. Anther-bases entire, or subauricled, style-arms of hermaphrodite flowers entire, obtuse. Achenes of female flowers linear, 5-10-ribbed, with soft snow-white pappus.

Uses:—The leaves are sometimes applied to wounds (Stewart). In Europe, they are smoked like tobacco, as a domestic remedy for asthma.

Pliny records its being used for smoking, and recommends it as a remedy for obstinate colds and coughs, and recommends both the roots and leaves.

Dr. Cullen recommends the use of the leaves in scrofula. According to him, the expressed juice of the fresh leaves, taken to some ounces every day, occasioned the healing up of scrofulous sores; a strong decoction of the dried leaves seems to have answered the same purpose.

670. *Doronicum Hookeri*, Clarke Mss., H.F.B.I.,
III. 332.

Vern.:—Darûnaj-akrabi (Pb.).

Habitat:—Sikkim Himalaya; Lachen and Tungu.

A robust herb, 1-2ft. high. Radical leaves 0, or soon withering; cauline 4-6 by 1-2in., often unequal-sided. Leaves all narrowed into short, ½ amplexicaul, petioles oblong or elliptic lanceolate, obtuse or acute, entire or irregularly toothed. Heads 2½in. diam. Involucre-bracts ovate-lanceolate, acuminate. Ligules about half as long. Achenes rife; not seen, says Hooker. Pappus short, reddish.

Use:—The root is an aromatic tonic, said to be used to prevent giddiness on ascending heights. (Baden-powell).

671. *Emilia sonchifolia*, DC. Var. *Sonchifolia proper*, H.F.B.I., III. 336; Roxb. 597.

Vern.:—Sādi-modi (B.); Muel-schevi (Mal.); Sādhi-mandi (Bomb.).

Habitat:—Common throughout India.

A slender somewhat glaucous herb, 10-18 in. high, glabrous puberulous or scabrid. Stems erect, or diffuse and often rooting at the nodes, more or less branched. Leaves 1½-4 in. long; lower petioled, lyrate-pinnatifid or obovate, entire or sinuate; upper smaller, amplexicaul, with acute or obtuse auricles. Heads ½ in. long, solitary or laxly corymbose; peduncles very slender, nodding when young. Invol-bracts nearly equalling the flowers, linear-oblong, acute, narrowly margined. Corollas pinkish-violet or white. Style-arms ¼-cylindric, the tip conic. Achenes ½ in. long, with 5 scabrid ribs. (Duthie).

Uses:—In Malabar, a decoction of the plant is said to be a febrifuge. Mixed with sugar given in bowel complaints (Rheede).

In Travancore, pure juice of the leaves is poured drop by drop into the eyes in night-blindness. The natives consider the juice as cooling as rose-water and prescribe it in eye inflammations (Drury).

672. *Notonia grandiflora*, DC. H.F.B.I., III. 337.

Vern.:—Wānder-roti (Mar.); Gaidar (Bomb.).

Habitat:—Hilly districts of the Western Peninsula, from the Concan southwards.

A small shrub, 2-3 ft. high, very fleshy. Branches very stout. Leaves 3-5 by 1-3 in., subsessile or petioled, obovate, or elliptic-lanceolate, quite entire. Flowering peduncles 6-12 in. long, stout, erect, naked. Corymb of few or many heads, ¾-lin. long. Achenes ¼ in. long, glabrous. Pappus hairs very slender, terete.

Uses:—The plant was brought forward in 1860, by Dr. A. Gibson, as a preventive of hydrophobia. The mode of administration is as follows:—About 4 ounces of the freshly-gathered stems, infused in a pint of cold water for a night, yield in the morning, when subjected to pressure, a quantity of viscid

greenish juice, which, being mixed with water, is taken at a draught. In the evenings, a further quantity of the juice, made up into boluses with flour, is taken. These medicines are directed to be repeated for three successive days.

Dr. Waring says that from official documents placed at his disposal, it appears that the remedy has been tried in numerous cases; but as at the time of the infliction of the wound, caustic was applied locally in the majority of cases, it is difficult to determine how far the *Notonia* operated, if at all, as a prophylactic (Ph. Ind.).

"An extract of the herb was tried by the late Dr. Haines and myself on dogs, and afterwards at the European Hospital in Bombay (1864). In one drachm doses it had a feebly aperient action; no other effect was observed" (Dymock).

673. *Senecio tenuifolius*, Burm. H.F.B.I., III. 345.

Vern.:—Sanggye, mentog, nimbâr (Pb.).

Habitat:—Western Peninsula; on the dry hills of the Western Ghats, from the Concan southwards.

Slender annual herbs, glabrous, much branched, or, like most annuals, says J. D. Hooker, reduced to a single weedy stem. Leaves sessile, pinnatifid or sub-2-pinnatifid lobes, very slender, spreading, obtuse. Heads few, long-peduncled, ebracteolate in divaricating corymbs; involucre-bracts 10-12½ in. long, ovate oblong, acute membranous, glabrous; ligules 6-10. Achenes 10 in., broader upwards, scabrid, equalling the reddish or yellowish pappus.

Use:—Mr. Honnigberger states that it is officinal in Kashmir. The *nimbar* of the Lahore drug-sellers may probably be the produce of this plant (Dr. Stewart).

674. *S. Jacquemontianus*, Benth, H.F.B.I. III. 350.

Vern.:—Hater mool (Kashmere).

Habitat:—Western Himalaya.

Perennial herbs, glabrous, robust. Stem stout, 3-5 ft. Leaves 1ft., broad and under, tip acute or rounded, broadly ovate-cordate or subhastate; obtuse-toothed, sinus open, petiole of lower stout winged, of cauline sheathing; 5-10in., wing narrow or broad, gashed or toothed. Racemes 4-8in., elongating in fruit. Heads not secund, numerous, peduncled, on a conical raceme, broadly campanulate; $1\frac{1}{2}$ -2in. across the ligules. Involucre-bracts $\frac{1}{2}$ in., glabrous, 8-12, oblong acute, bases subconnate. Ligules many, long and broad; 12-15, $\frac{1}{2}$ - $\frac{3}{4}$ in. long, 5-9-nerved, tip entire or toothed; tube of disk-corolla shorter than the limb. Achenes $\frac{1}{2}$ in. long, deeply grooved, linear, oblong. Pappus very short, coroniform, $\frac{1}{4}$ in., unequal, united at the base.

Use:—Its roots are officinal in Cashmere; they somewhat resemble Valerian in appearance and odor, and must prove a good medicine when their properties are once determined (Honnigberger). Said to be used to adulterate Kût (Sanssurea Lappa).

675. *S. quinquelobus*, Hook f: & T. H.F.B.I., III. 353.

Vern.:—Morta (Pb.)

Habitat:—Temperate Himalaya, from Garhwâl to Bhutan.

A herbaceous, glabrous, or sparsely pubescent plant. Root perennial. Stem slender, simple, long, erect, flexuous, grooved 2-3ft., naked below. Leaves 2-4in., sometimes as broad as long or even broader, rather glaucous beneath, petioled, membranous, cordate, or subreniform, bud 3-7-angled or palmately-lobed, upper not cordate; angles or lobes coarsely sinuate, toothed; teeth acute and apiculate. Petiole slender, not auricled. Heads narrow 5-6fid. Racemes a foot long or less, very slender, sometimes quite simple, with secund bracteate peduncles bearing solitary terminal heads and bulb-like leaf-buds in the axils; or the peduncle becomes an elongated branch bearing many bulbils. Involucre-bracts obtuse or acute, green, 5-6, linear, membranous. Ligules absent. Corolla large, tube shorter than the campanulate limb; anthers exerted, with

very short tails. Achenes $\frac{1}{10}$ in., slender, glabrous, shorter than the scanty white pappus; tip dilated.

Use:—In Kanâwar, the seeds are given for colic. (Stewart).

676. *S. densiflorus*, Wall., H.F.B.I., III. 355.

Vern.:—Chitawâla (Pb.).

Habitat:—Central and Western Himalaya, from Nepal to Bhotan, and the Khasia Mountains.

Shrubby plants. Branches, leaves beneath and corymbs clothed with appressed white, rarely grey, cottony wool. Branches stout. Leaves 5-9 by 1-3 $\frac{1}{2}$ in., glabrous or cottony above, narrowly or broadly elliptic, or obovate lanceolate acuminate, toothed (teeth often hooked); petiole, large, $\frac{1}{4}$ in., with often small, broad-toothed auricles. Heads campanulate, shortly pedunculated. $\frac{1}{2}$ in., long, many-fid, bracteolate in axillary and terminal branched subpanicked corymbs. Involucre-bracts 8-12, linear, acute, white tomentose (opaque). Receptacle pitted and bristly; ligules 8-10, very short. Achenes $\frac{1}{4}$ in., glabrous; pappus equalling or shorter than the tubular corollas, white.

Use:—The leaves are applied to boils (Stewart).

677. *Echinops echinatus*, DC. H.F.B.I., III. 358.

Sans.:—Utâti.

Vern.:—Utkatâra (Indian Bazars).

Habitat:—Upper Gangetic plains, N.-W. Himalaya, and the Punjab, from Benares westward, ascending to 5,000 ft. to Sirmore. Behar, Sindh. The Dekkan.

A much-branched, spreading, rigid annual, 1-2 ft. high, branched from the base. Branches wide-spreading. Leaves 3-5 in. long, sessile, oblong, pinnatifid, spines often 1 $\frac{1}{2}$ in. Balls of head white 1-1 $\frac{1}{2}$ in. diam. Outer invol. bracts 6-8 oblanceolate glabrous pungent one often spinescent; Involucre $\frac{1}{2}$ in., long, inner hardening around the obconic silky villous achenes. Achenes $\frac{1}{2}$ in. long.

Use:—The drug is considered to be tonic and diuretic. It is bitter, and appears to us to have the same properties as the

Carduus benedictus of Europe. (Pharmacographia Indica, Vol. II., p. 320).

678. *Carduus nutans*, Linn. H.F.B.I., III. 361.

Vern.:—Kanchhari, tiso, bādâward(Pb.); Gul-i-bādâward (Kashmir).

Habitat:—Western Himalaya, from Kashmir to Simla, and Hazâra in the Punjab.

A tall stout thistle, biennial, cobwebby, stem 1-3ft., usually simple grooved, interruptedly winged; wings sinuous, spinulose. Leaves 6-12in., variable, entire, 1-2-pinnatifid, waved, spinous. Heads $\frac{3}{4}$ -1 $\frac{1}{2}$ in. diam., solitary or fascicled, hemispheric or subcampanulate, inclined or drooping. Involucre-bracts subulate—lanceolate, outer or all terminating in a spreading, erect or, reflexed spine. Flowers crimson. Achenes pale brown, glabrous, granulate.

Use:—In the Punjab, the flowers are considered febrifugal (Stewart).

It is used in Kashmir to purify the blood(Punjab Products).

679. *Silybum marianum*, Gaertn., H.F.B.I., III. 364.

Habitat:—Punjab and N.-W. Himalaya, Peshawar, Hazâra, and from Kashmir to Jammu.

An annual or biennial shining thistle. Stem 1-4ft., grooved, not winged. Leaves larger, with strong spines. Heads 1-2in. diam., base intruded. Involucre-bracts coriaceous, with a spine $\frac{1}{2}$ - $\frac{3}{4}$ in. long, outermost mucronate. Receptacle fleshy; flowers rose-purple. Achenes $\frac{1}{4}$ in., transversely wrinkled, black or grey. Pappus white.

Uses:—Mr. George Foy (Medical Press for 1887, p. 492) calls attention to its properties. He states that this plant is now being received with professional favour in France, where the tincture and alcoholic extract are both being prepared. He remarks that the extract is a useful adjunct to aloes, since it possesses cholagogue properties (Ph. J. June 25, 1887, p. 1051).

'Dioscorides affirmed that the seeds being drunk are a remedy for infants that have their sinews drawn together, and for those that be bitten of serpents; and we find in a record of old Saxon remedies, that this wort, if hung upon a man's neck, it setteth snakes to flight.' [Sowerby's Eng. Bot., V., p. 5].

680. *Sassurea obvallata*, Wall., H.F.B.I., III. 365.

Vern.:—Bergandu tongur (Kumaon); Kanwal, Birm-kanwal (Pb.)

Habitat:—Western Himalaya, from Kashmir to Sikkim.

A simple pubescent, or glabrate herb. Root very thick, crowned with blackened remanis of petioles. Stem simple, leafy, 6-18 in., as thick as a little finger or less, terminated by the curved bladdery veined, translucent leaves, which form a pale head 3-6 in. diam. Leaves 4-6 in., glabrous, obtuse toothed, lower petioled, elongate-obovate, cauline, sessile, $\frac{1}{2}$ -amplexicaul oblong, concave, floral cymbiform membranous, enclosing 2-6 sessile or shortly peduncled glabrous heads. Heads $\frac{1}{4}$ - $\frac{3}{4}$ in. diam., hemispheric. Corolla $\frac{1}{2}$ in.; anther-tails very short, laciniate. Achenes ovoid, flattened, glabrous, ribbed. Pappus brown, $\frac{1}{3}$ in., outer bristles scabrid or O.

Use:—The root is used for application to bruises and cuts (Duthie).

681. *S. candicans*, Clarke, H.F.B.I., III. 373.

Vern.:—Batula; Kaliziri (Pb.).

Habitat:—Subtropical and Temperate Western India and the Himalaya, from the Salt Range, Hazârâ, and Kashmir to Bhotan.

Herbs, with 2-5 ft. stem, simple below. Inflorescence cottony. Leaves sometimes 18 by 5 in., oblong or ovate-oblong, entire or sinuate-toothed, or lobulate at the base, or lyrate-pinnatifid, glabrous or pubescent above, cottony or white tomentose, rarely glabrous beneath. Heads 1-1 $\frac{1}{2}$ in. diam, long, peduncles in large, open, panicled corymbs. Involucre-bracts, cottony or pubescent, lanceolate, acuminate. Receptacle bristles long. Corolla upward of $\frac{1}{2}$ in. long, anther-tails lacerate. Achenes $\frac{1}{2}$ in.,

5-angled, muricate, top cupular, very variable as to rugosity, Pappus hairs very slender, white, equalling the Corolla, outer absent.

Use:—The seeds are collected in the Punjab for the drug-sellers (Stewart). Carminative, used in *masâls* for horses (Calthrop, in Watt's Dictionary).

682. *S. hypoleuca*, Spreng. H.F.B.I., III. 374.

Habitat:—All over temperate Himalaya, from Kashmir to Sikkim.

Herbs, with stem, simple or branched above, leafy, rather slender, 2-5ft., glabrous or puberulous. Leaves lyrate or lyrate-pinnatifid, sinuate toothed, glabrous above, cottony or white beneath; membranous, terminal lobe large sometimes 5in. diam, deltoid acute, lateral generally one pair triangular, acute; 3-8in., variable in breadth, petioled or sessile; petiole auricled at the base or not. Heads 1½-2in. diam., globose, nodding or inclined, very many-fid, base often intruded, long peduncled. Involucre very broad and open, bracts lanceolate, acuminate, ciliate, often recurved. Corolla ½in., limb as long as the tube. Anther-tails long, subulate, quite entire, or split near the tip. Achenes short, 4-angled, tubercled, ½in. long, almost cubical, with obtuse angles, black; tip contracted, with a terminal toothed cup. Pappus single, ½in., brown.

Use:—It appears probable that part of the costus used medicinally in India is derived from this species (Watt).

683. *S. Lappa*, Clarke, H.F.B.I., III. 376.

Syn.:—Aplotaxis Lappa, Dene; Aucklandia Costus, Falconer.

Sans.:—Kushtha; Kashmirja.

Vern.:—Kut; Kust (H.); Pachak, Kur (B.); Post-khai (Kashmir); Kusta (Bhote); Kut, kot (Pb.); Duplate (Bomb.); Upaleta; Kut (Guz.); Kostum, putchuck, goshtam (Tam.); Changala, Kustam (Tel.); Sepuddy (Malay.)

Habitat:—Kashmir.

Tall, very stout, herbs. Stem 6-7ft., very robust, as thick as the little finger, below. Leaves membranous, scaberulous above,

glabrate beneath, irregularly toothed. Radical leaves, with the petioles 2-3ft. long, terminal lobes often a foot in diameter; cauline leaves 6-12in. long, with a short petiole, or sessile, with an auricled $\frac{1}{2}$ -amplexicaul base. Heads very hard, subglobose, 1-1 $\frac{1}{2}$ in diam., sessile axillary, or in a terminal cluster of 2-5. Involucre-bracts numerous, purple, young, pubescent, ovate lanceolate, acuminate, rigid, squarrosely recurved, glabrous. Receptacle bristles very long, $\frac{3}{4}$ in. Corolla dark-purple, $\frac{3}{4}$ in. long. Anther-tails fimbriate. Achenes upwards of $\frac{1}{2}$ in., compressed, curved with thickened margins and one rib on each face, top contracted and cupped, tip narrowed. Pappus hairs double, all feathery, $\frac{3}{4}$ in., brown.

Supposed to be the *Costus* of the Ancients (J. D. Hooker).

Uses:—*Kust* has been used in Hindu medicine from the earliest ages. It is said to be aphrodisiac and tonic, and useful in diseases arising from deranged air and phlegm, also in asthma and for resolving tumours (Meer Muhammad Husain). It was formerly smoked as a substitute for opium. U. C. Dutt, in his *Hindu Materia Medica*, states that the "root is described as aromatic, stimulant and useful in cough, asthma, fever, dyspepsia, and skin diseases. Mr. Baden-Powell gives an interesting summary of the uses of *kust*; the dried powder is the principal ingredient in a stimulating ointment for ulcers; it is a useful hair-wash; it is used as an ingredient in a stimulating mixture for cholera; the root is a valuable perfume and is a preservative to woollen cloths.

By the native practitioners it is prescribed as a stomachic and tonic, and in the advanced stage of typhus fever. In the Punjab, applied in powder, to ulcers, for worms in wounds, and also in rheumatism; also considered depurative and aphrodisiac (Murray, 185).

684. *Jurinea macrocephala*, Benth. H.F.B.I., III. 378.

Vern.:—Dhup, dhúpa, gúgal (Pb.).

Habitat:—Western Himalaya, from Kashmir to Kumaon., Stemless. Root woody, perennial. Leaves spreading, 6-18 by 1 $\frac{1}{2}$ -7in., oblong-lanceolate, pinnate or pinnatifid, denticulate,

cobwebby or cottony above thickly white, tomentose beneath; long or short-petioled lobes or segments contiguous, broad, sometimes crisped, teeth acute or mucronate. Heads 3-30, $\frac{2}{3}$ -lin. diam., sessile or shortly peduncled. Peduncles stout, tomentose, often cottony at the base. Involucral bracts $\frac{3}{4}$ -1 $\frac{1}{2}$ in., scabrid or smooth, erect, scarious; outer involucral bracts ovate lanceolate; inner elliptic-lanceolate, long, acuminate. Receptacle bristles very rigid, much shorter than the achenes united into lacinate cups. Anther-tails lacerate. Corolla 1-1 $\frac{1}{4}$ in. Achenes large, cuneate, obovate, unequally 4-5-angled, tubercled, $\frac{1}{4}$ - $\frac{1}{2}$ in., curved, compressed, truncate, ashy grey. Pappus copious, lin., brown hairs cohering at base. "The roots, called Dhup, are collected and used by Hindus as incense (Aitchison).

Use:—The bruised root is applied to eruptions, and a decoction is given in colic. It is also considered cordial and given in puerperal fever (Dr. Stewart).

685. *Tricholepis glaberrima*, DC. H.F.B.I., III. 381,

Vern.:—Brahmadandi (M.). Motabor (Bom).

Habitat:—Central India, Merwara, the Concan, and the Deccan.

An annual, slender, unarmed herb, quite glabrous, erect, rigid. Branches slender, angled and ribbed, quite smooth. Leaves sessile, 2-3in. long, linear oblong, or lanceolate, acute, entire or serrate, scaberulous and covered with raised points, prominently nerved; base simple or auricled. Heads small, ovoid $\frac{1}{4}$ - $\frac{1}{2}$ in. diam. Involucre-bracts subulate from a lanceolate base, sub-erect. Receptacle bristles narrowly linear, exceeding the pappus. Achenes oblong, faintly ribbed, twice as long as the pappus.

Use:—Believed to be a nervine tonic and an aphrodisiac, and used in seminal debility. (S Arjun.)

686. *T. montana*, Dalzell and Gibson, H.F.B.I., III. 383.

Vern.:—Utakatâra (M.).

Habitat:—The Western Ghauts.

A coarser species than the preceding; leaves obovate-oblong, very coarsely toothed or sometimes pinnatifid.

Use:—It is a bitter tonic and a diuretic, and is used in coughs (S. Arjun).

687 *Volutarella divaricata*, Benth. H.F.B.I., III. 383.

Syn.:—*Carduus ramosus*, Roxb. 595.

Vern.:—Bâdâward (Bomb.); Sakayi (M.).

Habitat:—Central, Western and Southern India, from Behar and the Upper Gangetic plains to Lahore; and from Sind to Mysore and the Deccan; ascending to 3,000 ft. in the N.-W. Himalaya.

An annual straggling stiff weed, dichotomously branched; branches 1-2 ft. long, angled, smooth or scabrid. Leaves very variable, oblong or obovate, entire, toothed or pinnatifid, 1-2 by $\frac{1}{4}$ - $\frac{2}{3}$ in., rarely 6 by 3 in., sessile, base simple, lobes rounded, mucronate, often undulate or crisped. Heads $\frac{1}{2}$ -lin. long, $\frac{1}{4}$ - $\frac{1}{2}$ in. in diam., hard, with spiny involucre-bracts. Involucre-bracts ovate, glabrate reddish, with a long spreading or recurved spinescent awn; spines $\frac{1}{4}$ - $\frac{1}{2}$ in., smooth; receptacular bristles short. Corolla $\frac{1}{2}$ in., straight, pale-purple. Achenes $\frac{1}{2}$ in., narrow, acutely 4-5-angled, striate and punctate between the angles, base narrow; areole small, lateral, deeply excavated, top broad, truncate; pappus spiny, of many unequal scabrous hairs, $\frac{1}{2}$ in. long, silvery brown, 3 or 4 innermost flattened and long (J. D. Hooker).

Uses:—The author of the Makhzan says that the plant has tonic, aperient and deobstruent properties. It is said to drive away noxious reptiles when kept in the house (Dymock).

Slightly mucilaginous, and is used in coughs (S. Arjun). It is used as a febrifuge and is often prescribed in fevers and general debility (R. N. Khory.)

688 *Carthamus tinctorius*, Linn. H.F.B.I., III. 386; Roxb 595.

Sans.:—Kusumbha, kamalottara, kúshumbha.

Vern.:—Kusum, kásumba, kar (the seed), barre (Hind); Kusum, kusam phul, kajirah, darhua (the oil), kuthi (thorny), murdi or mundo (thornless variety) (Beng.); Galâp machû, (Manipur); Kûsam, kûrtam, kushumbha, ma, sufir, karar (khar, polian=seed), (Pb.); Barre, kar, (United Prov.); (Bundi, Raj); Kusumba, kur dai, (Bomb.); Kusumbo (kabri=the seed), (Guj.); Kurdi, kavarihi, kasdi, sadhi (oil plant), kardai, (Mar.); Kusumba, (Cutch); Powari-jo-bij, kardai, kurtum (seed), khoinbo (the plant), (Sind); Khardi, (oil), kasar (thorny), kusum (smooth variety), (C. P.); Karad, (Dec.); Sendurgam, kushumba, kushumba-virai, sendurkun, (Tam); Agnisikha, kushumba-vittu-lu, (Tel); Kusanbe (or kusambi), kusumba, (Kan).

Eng.:—The Safflower.

Habitat:—Cultivated throughout India.

Thistle-like herbs, glabrous or pubescent. Leaves entire and unarmed, or spinulose serrate. Outer Involucre-bracts ovate-oblong, constricted above the base green-spinous, or not. Inner Involucre-bracts ovate-oblong, acute. Flowers orange-red. Achenes (often deformed) obovoid, 4-angled, truncate at the top, with 4 bosses; pappus absent.

Parts used:—The seed, oil and flowers.

Uses:—The Sanskrit writers describe the seeds as purgative, and mention a medicated oil, which is prepared from the plant for external application in rheumatism and paralysis. Mahomedan writers consider the seeds as laxative, having the power to remove phlegmatic and adust humors from the system. (Dymock).

"The powdered seeds made into a poultice, are used to allay inflammation of the womb after childbirth. The oil is used as a liniment in rheumatism" (Surg.-Maj. Calthrop).

The oil is used as a dressing for bad ulcers (Ainslie).

In the Punjab seeds considered to be diuretic and tonic (Stewart).

"In large doses, Carthamus is said to be a laxative; and, administered in warm infusion, diaphoretic. It is used as a substitute for saffron in measles, scarlatina, and other exanthematous diseases to promote the eruption" (U. S. Dispensary).

According to Burham, a drachm of the dried flowers taken internally, cures jaundice (Hort-Jamaica, l. 72).

In Bengal (Dumraon) the oil is considered by the ryots as a valuable remedy for itch. A cure is said to be effected after 3 to 6 applications. The young green plant is said to be very efficacious in colds. It is believed to keep the system warm. The charred oil is used for healing sores and for rheumatism. As a veterinary medicine the oil occasionally finds use in healing sores on cattle.

The oil of the seed is used as medicine in the United Provinces. The meal of the cooked seed is called *harira* and is considered a curative and specific for colic pain.

In the Central Provinces the oil extracted by the dry hot method is employed as a salve for sores on cattle.

In Sind, the seed is employed as a cooling medicine (*thadhoh*); it is sometimes boiled and made into gruel. The oil is considered a mild purgative. (Agricultural Ledger 1904—No. 11).

The seeds and fruits contain about 30 per cent. oil, but owing to the thick husk, only 17 or 18 per cent. of the oil is obtainable by pressing. The kernels constitute about 40 per cent. of the seeds and can only be removed by special machinery. The composition of the seed and the undecorticated and decorticated cake have been shown by Dr. Leather.

		Seed.	Undecorticated cake.	Decorticated cake.
Moisture	...	7.49	8.79	8.49
Oil	...	31.84	9.84	9.80
Albuminoids	...	13.31	16.06	32.75
Carbohydrates	...	18.66	27.23	21.19
Fibre	...	26.31	33.83	20.17
Ash	...	2.39	4.25	7.60
		100.00	100.00	100.00

The oil obtained by expression in the cold is pale yellow in colour, and is used for culinary purposes. It has good drying powers and although it cannot replace linseed oil it should certainly form a substitute for it in many instances and find extended use in the manufacture of soft soap.

A dark coloured empyreumatic oil is prepared from the seeds by a simple process of destructive distillation. This is used for the preservation of leather buckets and ropes exposed to the action of water.

Crossley and Le Sueur in 1898 examined several samples of safflower oil obtained from various districts, and their constants are thus summarised: Specific gravity, 0.9251 to 0.9280; saponification value, 187.2 to 193.3; iodine

value, 129.8 to 149.93; Reichert-Meissl value, 0.0; refraction at 40°, 65.2; acid value, 0.76 to 20.02; optical activity in 200 m.m. tube + 4° to + 14°; fatty acids, per cent. 95.4; solidifying point, 16°; neutralisation value, 199.

The saturated fatty acids contained in this oil consist of palmitic and stearic acids. Le Sueur found the liquid fatty acids to be oleic and linolic acids. Tylaikoff confirms the presence of oleic and linolic and linolenic acids. Lewkowitsch determined the amount of unsaponifiable matter in several samples to be 1.5 per cent., and the true acetyl value he found to be 16.1, 12.85 and 12.78. (Agricultural Ledger 1911-12—No. 5).

689—*Dicoma tomentosa*, Cass., H.F.B.I., III. 387.

Vern.:—Navananji-châ-pâlâ (Belgaum).

Habitat:—North-West India; Dhoulpoor; Scind; Western Peninsula; from the Concan southwards, in gravelly places.

An erect annual, 10-18 in. high, much branched, clothed with white cottony wool; branches terete. Leaves sessile, linear or linear ovate, obtuse or acute, quite entire, 1-3 in., glabrate or cottony above, nerves obscure. Heads many, subaxillary, glabrous. Spines of involucre-bracts yellowish, shining. Bracts $\frac{1}{2}$ - $\frac{2}{3}$ in. subulate, straight, glabrous. Corolla $\frac{1}{4}$ in., outer pappus elastic, shining, bristles slender, inner $\frac{1}{4}$ in. long, narrowly subulate, lanceolate, pale-brown, strongly ribbed, membranous and hyaline, margins undulate. Achenes broad and short, $\frac{1}{8}$ in. long, turbinate, densely silky.

Use:—The herb is strongly bitter, and is used in the neighbourhood of Belgaum as a febrifuge, especially in the febrile attacks to which women are subject after childbirth (Peters).

690—*Cichorium Intybus*, Linn., H.F.B.I., III. 391.

Vern.:—Kâsni (H.); Kashini-virai (Tam.); Kâsini-vittulu (Tel.); Hand, gul, suchal, kâsni (Pb.); Kâsani (Guz.).

Habitat:—North-West India; Kumaun.

Perennial herbs. Root fleshy, tapering. Stems and leaf nerves beneath hispid. Stem 1-3 ft., angled and grooved. Branches rigid, spreading. Leaves runcinate, oblong-lanceolate, upper cordate, amplexicaul. Heads 1-1 $\frac{1}{2}$ in. diam. solitary and terminal and axillary, clustered. Peduncle thickened in the middle.

Involucre-bracts herbaceous, glandular, hispid, much shorter than the Corolla ligules bright blue, rarely white or pink, truncate, 5-toothed. Achenes angled, pale, molted; pappus pale, obtuse, very short.

Parts used :—The root, seed and flower.

Uses :—Has tonic, demulcent and cooling properties. The seeds are considered carminative and cordial. A decoction of the seeds is used in obstructed menstruation (S. Arjun).

The root is bitter, and used medicinally in the Punjab. An infusion of the chicory mixed with syrup causes a thickening of the liquid (Balfour).

Flower, made into Sherbet, is given in liver disorders.

A strong infusion of powdered seeds proves highly useful in checking bilious vomiting (Surg. Levinge, in Watt's Dictionary).

Its roots are used as a substitute for coffee. Drs. Letheby and Hassall say :—

"No one who is acquainted with the respective properties of chicory and coffee can for a moment entertain the opinion that the former can be effectively substituted for the latter. *** Now, it is a well ascertained fact, that of all parts of vegetables the fruits and seeds usually possess the most active properties. This is no doubt due to the circumstance of their being freely exposed to the influence of light and air, agencies which promote chemical changes in plants, and so effect the elaboration of those complex organic substances on which the activity of vegetables depends. On the other hand, it must be manifest that, as the roots are removed from the influence of these powerful agencies, they cannot be so richly endowed with active properties; and, indeed, there are but few roots which contain either alkaloids or volatile oils—the two classes of constituents which give to coffee its peculiar virtues."

Chicory is prepared from the older roots which are first cleansed by washing, then cut into slices and dried in a kiln, afterwards they are roasted and powdered.

The medicinal properties of chicory closely resemble those of *Taraxacum*, regarding which Dr. Pereira writes :—

"Its obvious effects are those of a stomachic and tonic. In large doses, it acts as a mild aperient. Its diuretic action is less obvious and constant. In various chronic diseases its continued use is attended with alterative and resolvent effects; but where the digestive organs are weak and readily disordered, taraxacum is very apt to occasion dyspepsia, flatulence, pain, and diarrhoea."

Drs. Letheby and Hassall undertook to ascertain the effects of roasted chicory on the human system. Three persons partook of a chicory breakfast; the infusion was dark colored, thick, destitute of the agreeable and refreshing aroma so characteristic of coffee, and was of a bitter taste. Each individual experienced for sometime after drinking the fusion, a sensation of heaviness, drowsiness, a feeling of weight at the stomach, and great indisposition to exertion; in two headache set in, and in the third diarrhoea came on. Hence the wholesome properties of chicory as an article of diet are questionable. There is hardly any advantage of the admixture of chicory with coffee. Chicory, from its narcotic character, exerts an injurious effect on the nervous system; according to some oculists, chicory-coffee is considered as among the causes of amaurotic blindness.

691—*C. Endivia*, Linn., H.F.B.I., III. 391.

Vern.:—Kásni (H. and Pers.); Káshini-virai (Tam.); Koshee (Tel.); Saz-e-hand (Cashmere).

English:—The garden endive.

Habitat:—Northern India.

It resembles the preceding species, but is more glabrous.

Uses:—It is much valued by the Hakims as a resolvent and cooling medicine, and is prescribed in bilious complaints much as *Taraxacum* is with us (Dymock).

The root is used in dyspepsia and fever as a tonic and demulcent; fruit, a cooling remedy for fever, headache and jaundice. (T. N. Mukerji.)

The root is considered warm, stimulating and febrifuge; given in "Munjus," the diluent taken preparatory to purging; the seed is used in sherbets (Irvine).

692—*Taraxacum officinale*, Wigg., H.F.B.I., III. 401.

Vern.:—Dúdal; Baran; Kanphúl; Dudli; Shamooke (Pb.); Buthur (Sind.); Pathree (Dec.).

Habitat:—Throughout the Himalaya and Western Tibet, and the Mishmi Mountains.

A scapigorous, milky herb, perennial. Root vertical. Leaves all radical, glabrous, or crown and scape woolly; leaves, sessile, oblanceolate or linear, entire, toothed, pinnatifid or runcinate;

lobes acute, more or less denticulate. Heads solitary. Involucre campanulate. Inner Involucre-bracts erect, often thickened or clawed at the tip; outer ovate or linear, appressed, more or less recurved. Achenes narrowly obovoid, ribbed. Ribs muricate or echinate, above the middle, contracted into a very slender beak, equalling or exceeding the body. According to Hooker, it is one of the most variable of the order.

Uses :—The root is officinal, being alterative, tonic and cholagogue. It is useful in dyspepsia, chronic hepatic affections, especially in torpor and congestion of the liver, and in jaundice and chronic cutaneous diseases (Pharm. Ind.) It is tonic, aperient and diuretic, and is said to have an almost specific action on the liver, by modifying and increasing its secretion. The dried root, when powdered, is frequently used, mixed with coffee. When roasted and powdered, it has been used as a substitute for coffee (Bentley and Trimen).

A decoction of the roots and leaves is employed in chronic disorders of the liver.

"In Holland, the extract of Dandelion is a common remedy for the intermittent fevers and agues, so prevalent in that marshy country. The roots are taken up about Midsummer, and those only of some year's growth are esteemed valuable, as the active principle they contain increases with age; this principle is called *Taraxacin*. In Germany, the roots are cut into pieces, roasted, and used as a substitute for coffee. In this country, Dandelion coffee is sometimes used for medicinal purposes, * *

"Dr. Withering tells us that the diuretic properties of this plant are very certain, and well known to all country people. When a swarm of locusts had destroyed the harvest in the island of Minorea, many of the inhabitants subsisted on this plant. The expressed juice has been given to the quantity of four ounces, three or four times a day; and Boer have had a great opinion of its utility in visceral obstructions. The roots contain gum and sugar, and a large quantity of inulin, a substance analogous to starch. A kind of beer is obtained by the fermentation of the plant in Canada."—Sowerby's English Botany, Vol. V. p. 145.

693.—*Lactuca Heyneana*, DC., H.F.B.I., III. 403.

Syn.—*Prenanthes racemosa*, Roxb. 594.

The common garden Lettuce, cultivated throughout India.

Vern. :—Undirá-chá-kán (Mar).

Habitat.—North-Western India; Banda; Western Peninsula; common in fields.

Annual or biennial herbs, 1-4ft. high, with radical leaves, tall, glabrous. Stem hollow below, often very stout and much branched. Radical leaves 6-12in., very irregularly pinnatifid, teeth cartilaginous; these leaves are narrowed at the base. The upper leaves are runcinate pinnatifid, finely spinulose or ciliate-toothed, membranous. The cauline leaves few, narrower, $\frac{1}{2}$ -amplexicaul, auricled. Flowering stems slender, branches erect. Heads $\frac{1}{2}$ in. long, solitary or fascicled; fascicles distant, spiked or subracemose; rarely peduncled, bracteate. Inner involucre-bracts, with thickened ribs in fruit. Achenes $\frac{1}{10}$ in., oblanceolate, then suddenly contracted, shortly beaked, muricate, black, half the length of the flexuous silver persistent pappus.

Use.—It is used as a substitute for *Taraxacum*, and is called by the Portuguese *Tarazaco* (*Pharmacographia Indica*, Vol. II., p. 319).

694—*L. remotiflora*, DC. H.F.B.I., III. 403.

Vern.:—Undira-châ-kân (Mar.).

Habitat:—Banda and Sind.

A smaller and more delicate plant than the preceding, with smaller obovate and nearly entire rarely pinnatifid radical leaves. Flowering stems less branched. Heads usually solitary on the naked branches, distinctly peduncled. Achenes $\frac{1}{6}$ -in., nearly as long as the soft silvery persistent pappus.

Use:—The whole plant is used as a substitute for *Taraxacum* at Goa, and is called by the Portuguese, *Taraxaco* (Dymock).

695—*L. Scariola*, Linn., H.F.B.I., III. 404.

Syn.:—*L. Sativa*. Roxb. 593.

Eng.:—The garden lettuce, cultivated throughout India.

Vern.:—Kâhoo, Salâd, Khas (H.); Sâlád, Kâhu (B.);

Habitat:—Western Himalaya, from Murree to Kunawar,

An annual or biennial, glabrous or nearly so; tall, erect, very leafy. Stems erect, 2-5ft., branched, usually prickly towards the base. Leaves sessile, 5-7in., pinnatifid, segments toothed, pointing downwards; lower surfaces usually prickly on the midrib and nerves; stem-leaves lobed at the base. Heads $\frac{1}{2}$ in. long, erect; flowers yellow. Achenes brown; beak very slender, about as long as the body (Collett).

"Inflorescence," says J. D. Hooker, "variable, sometimes 12in. diam.; with incurved, ascending corymbose branches, at others laxly paniculate. Branches and peduncles. White, with many appressed, green, cordate bracts. Involucre-bracts ovate, inner linear; ligules yellow or dull-reddish outside. Achenes $\frac{1}{4}$ in., including the very slender beak, ribbed, pale; pappus $\frac{1}{2}$ in.

Use:—In the wild state the seeds produce to a certain extent narcotic and sedative effects, but these appear to be almost entirely removed by cultivation (Dymock).

From the sap may be prepared a resinous dry juice, known commercially as *Lactucarium*. The common Lettuce yields only about 18 grains for each plant, but the scented and wild English Lettuce, *Lactuca virosa*, Linn., yields 56 grains. This juice is prepared just as the plant begins to flower. Dr. Duncan, nearly a century ago, showed that the juice might be used as a substitute for opium, having most of the properties of that drug without its binding effects. Smith, in his *Dictionary of Economic Plants*, mentions an instance, in July 1879, where a man died from the effects of the narcotic, through eating lettuce. Thus, it would seem that the strength of the narcotic varies considerably, and that the drug is not certain. Its action is not so reliable as opium, but it may be used as a mild hypnotic. Dose 2 to 10 grains of the dry juice. The officinal preparation is the Extract prepared from the fresh plant; a mild sedative, anodyne, purgative, diuretic, diaphoretic, and antispasmodic, said to be useful in the treatment of the coughs in phthisis, bronchitis, asthma and pertussis. It has also been recommended for rheumatism and insanity with doubtful results. In native medical practice, a decoction of the seeds is used as a demulcent. Dose 3ii to 3ss. (Watt).

The seeds are given boiled or made into a confection, in cases of bronchitis, especially chronic ones. (Calthrop in Watt's Dictionary).

Lettuce poultice acts as a soothing application to painful and irritable ulcers (Shircore, in Watt's Dictionary).

The juice from the incised flower-stalk of *Lactuca virosa* and other species, collected and dried, is known as Lactucarium. Syrup and tincture of this are used as a sedative in irritable cough.

696—*Sonchus oleraceus*, Linn., H.F.B.I., III. 414, Roxb. 593.

Vern. :—Titaliya (Patna); Dodak (Pb.); Ratrinta (Tel.); Mhâtâra (Bomb.)

Habitat :—Throughout India, in fields and cultivated places (J. D. H). Common in Simla fields (Collett). Trimen observes that the plant is found as a weed in cultivated ground in Ceylon.

Annual erect, milky glabrous or sparsely glandular hispid herbs, subumbellately branched above. Stems 2-3ft. Leaves thin, lanceolate entire or pinnatifid, 3-6in., $\frac{1}{2}$ -amplexicaul, with acute auricles, terminal lobes large, lateral lobes pointing downwards; sometimes only one pair; teeth small; basal lobes acute entire or pinnatifid. Heads $\frac{3}{4}$ -1in. diam., arranged in umbellate cymes. Achenes compressed; faces 3-ribbed and muricate between the ribs.

Uses :—According to Dr. Landry, the brownish gum formed by evaporation of the common sow thistle, when taken internally in a dose of 2-4 grains, behaves as an "intensely powerful hydragogue cathartic" and acts powerfully upon the liver, duodenum and colon. In its general effects, it is said to most resemble elaterium, producing large and watery discharges, so that it has proved a valuable therapeutic agent in ascites and hydrothorax. It requires, however, great care in its administration, since it has the disadvantage of griping like senna, and producing tenesmus like aloes. To counteract this, and to "correct its fierce attacks on the mucous membrane of the intestinal tract," Dr. Landry recommends that the gum should be administered

in combination with manna, aniseed and carbonate of magnesia, or with stimulants and aromatics, (Ph. J. for Sept. 1., 1888, p. 162).

The root and leaves are used by the natives of Bengal in infusion. as a tonic and febrifuge, (Irvine.)

"Its hollow thick stems are full of a milky juice, which renders it a very acceptable food to most animals—pigs, sheep, and rabbits are particularly fond of it. It has also been used as an article of diet by men from a very early date. It is recorded by Pliny that Hecate regaled Theseus, before his encounter with the bull of Marathon, upon a dish of Sow-thistles. The ancients considered them very wholesome and strengthening, and administered the juice medicinally for many disorders, ** In Germany, the leaves are put into salads, **" [Sowerby's English Botany, Vol. V., p. 153].

697. *S. arvensis*, Linn., H.F.B.I., III. 414.

Syn.:—*S. orixensis*, Roxb. 593.

Vern.:—Sahadevi bari (H.); Bhangra, kala bhangra (Pb.); Ban-pálang (B.); Nallá-tapata (Tel.); Birbarangou (Santal).

Habitat:—Throughout India; wild in cultivated places, scarce in the plains, common in the Khasia and Himalaya.

Annual milky herb, glabrous towards the base, glandular hairy upwards. Root-stock creeping. Stem 3-4ft., glabrous, tall, hollow, angular, umbellately branched above. Leaves nearly radical pinnatifid, 4-6in., lobes pointing downward, teeth small, basal lobes rounded, appressed to the stem. "Leaves," says J. D. Hooker, "runcinate pinnatifid, spinous toothed, cauline $\frac{1}{2}$ -amplexicaul, with appressed rounded auricles, uppermost linear. Heads 1-2in. diam (Simla)." Heads and peduncles, "says J. D. Hooker, "glandular hispid." Achenes narrow, subcompressed, with thick regular ribs on each face.

Use:—Cattle are fond of every part of the plant. On being wounded, there is much milky juice discharged, which thickens into a substance like fresh soft opium (Roxburgh).

Similar to *Lactuca scariola*, Linn., in medicinal properties (Watt).

Among the Santals the root is given in jaundice, (Revd. A. Campbell).

698. *Launea asplenifolia*, DC. H.F.B.I., III. 415 ;
Roxb. 594.

Vern. :—Tik-chañâ (B.) ; Birmalla (Santali).

Habitat :—Plains of India, from the Punjab to Assam, and southwards to the Sunderbuns, Circars, Andamans, &c.

Biennial or perennial, glabrous herb, with juice yellow. Leaves 3-6in., sessile or shortly petioled, narrowly obovate, lobes minutely toothed. Radical leaves sinuate-lobed or pinnatifid, cauline few. Flowering stems many from the root, ascending almost naked, 6-18in., long ; branches dichotomous, divaricating. Heads $\frac{1}{2}$ in. terminal paniculate, peduncles bracteate. Bracts one or two, subulate. Involucre-bracts quite glabrous, small ; inner linear, margins membranous. Achenes not winged, minute $\frac{1}{12}$ in., pale, very narrow. Pappus white soft, $\frac{1}{2}$ in., deciduous, hairs about equal length, with no stronger inner ones (J. D. Hooker).

Use :—The root of this plant, along with that of *uttri dudhi*, pounded and boiled in mustard oil, is given as a lactagogue by the Santals (Revd. A. Campbell).

699. *L. nudicaulis*, Lees. H.F.B.I., III. 416 ;
Roxb. 593.

Vern. :—Batthal, dâdhlak, tariza, spûdukei (Pb.).

Habitat :—Throughout the plains of India.

A glabrous, perennial herb, with yellow juice. Stems tufted, usually decumbent, numerous branching, 6-24in. Roots with yellow juice ; the stems are naked, or with a few small leaves below the flower-clusters. Leaves 2-10 by 1-3in., usually sessile, sinuate lobed, pinnatifid or runcinate (J. D. Hooker) ; lobes irregularly lobulate and sharply toothed, teeth often white and cartilaginous. Flowering stems usually very numerous, 6-24in. long, spreading on all sides, stout or slender, simple or branched. Heads $\frac{1}{2}$ - $\frac{2}{3}$ in. long, clusters of 2-5 or about 10, rarely solitary, forming much interrupted racemes, or crowded together at the end of branches. Involucre-bracts overtopping the pappus. Achenes much shorter than the pappus (Collett), $\frac{1}{12}$ in., very

pale, polymorphous, inner sometimes as if compressed, of 4 thick ribs, outer slightly curved and flattened, with a thick ventral and several thick dorsal ribs, all smooth and obscurely uneven. Pappus $\frac{1}{3}$ - $\frac{1}{2}$ in., very deciduous, hairs very straight, soft and of nearly equal length.

Use:—In the Southern Punjab, the plant is used medicinally in *sharbat* (Stewart).

700. *L. pinnatifida* Cass. H.F.B.I., III. 416.

Vern.:—Pâthri (Bomb.); Ban-kahu (Sind.); Almirao (Goa).

The juice known as *khee khowa* (Sind).

Habitat:—Sandy coasts of India, from Bengal to Ceylon, Madras and Malabar.

Perennial glabrous herb, juice yellow. Leaves runcinate pinnatifid or sinuate, toothed or lobed, 1-3 in., rarely more, teeth rarely white and cartilaginous. Flowering stems procumbent, long, flagelliform, rooting and leafing at the nodes, 1-3 ft. long, arching from node to node. Heads at the nodes solitary or clustered, $\frac{1}{2}$ in. long, usually with bracteate peduncles. Involucre-bracts almost 3-seriate, with white membranous margins, outer short, immediate longer, inner linear; midrib at the base hardening in fruit. Achenes columnar, very thickly ribbed, much shorter than the soft white straight deciduous pappus, $\frac{1}{2}$ in. pale, set with a few very thick rounded ribs, usually obtusely 4-gonous, pappus $\frac{1}{4}$ in.

Uses:—Used at Goa as a substitute for *Taraxacum*. In Bombay, it is given to buffaloes to promote the secretion of milk (Dymock).

The juice is used as a soporific for children, in doses of half a mâssa, and is externally applied in rheumatic affections, combined with the oil of *Pongamia glabra* or the juice of the leaves of *Vitex leucoxydon*. (Murray.)

N. O. GOODENOVIÆ.

701. *Scævola Kœnigie*, Vahl H.F.B.I., III. 421
Roxb. 177 (under *S. Taccada*).

Vern.:—Bhadrâk (Bomb.).

Habitat:—Sea-shores of India, from Sind to Ceylon, and from Burina to Malacca.

A large shrubby plant with thin loose bark; stem and branches stout. Leaves 3-5 in., alternate, entire or rarely obscurely crenate, silky or glabrescent, tufted in the axils, petioled, obovate-oblong, obtuse, herbaceous. Flowers white, tinged with purple. Cymes axillary, much shorter than the leaves. Bracts small. Calyx-lobes $\frac{1}{8}$ - $\frac{1}{4}$ in. linear-lanceolate, obtuse and enlarged in fruit. Corolla-tube $\frac{3}{4}$ in., oblique split to the base behind, narrow pubescent; lobes $\frac{1}{4}$ - $\frac{1}{2}$ in., lanceolate, anthers free. Indusium of the stigma ciliate; ovary 2-1 celled, with 2 erect ovules. Drupe $\frac{1}{8}$ - $\frac{1}{2}$ in., subspherical, very succulent; endocarp long.

Use:—The juice of the berries is instilled by the Amboyans into the eyes to clear off opacities and take away dimness of vision (Rumplins).

N. O. CAMPANULACEÆ.

702. *Lobelia nicotianæfolia*, Heyne., H.B.F.I., III. 427; Roxb. 170.

Vern.:—Deonal, Bokenal, Dhaval (Mar.).

Habitat:—Malabar; on the Ghauts, from Bombay to Travancore.

Tall herbs; stems usually much branched upwards, 5-12 ft., erect, somewhat pubescent or glabrate; below an inch and a half or more in diameter, and almost solid; the upper portion is a hollow tube ending in a crowded head of flower spikes which are about a foot in length. Leaves mostly radical, resemble those of the tobacco; narrowly obovate-lanceolate, lower often 12 by 2 in., upper gradually smaller, subsessile, serrulate herbaceous, glabrous or nearly so above, pilose or glabrous beneath. Inflorescence compound; racemes dense, more or less pubescent; peduncles $\frac{1}{2}$ in. and upwards. Flowers large and white. Calyx-tube glabrous or pubescent; teeth $\frac{1}{2}$ in.; linear, gland-denticulate. Corolla $\frac{3}{4}$ -1 $\frac{1}{4}$ in., glabrous or pubescent. Anthers glabrous, on the back rarely a little hairy. Capsule $\frac{1}{2}$ diam., subglobose, two-celled, each cell containing a fleshy placenta.

Seeds ellipsoid, compressed, not margined; numerous, very small, (1-50 of an inch in length).

Uses:—An infusion of the leaves is used by the natives as an antispasmodic (Ph. Ind.).

The dry herbs and seeds are said to be extremely acrid, and, according to Dymock, the dust of the former irritates the throat and nostrils like tobacco. Lisboa states that the seeds contain an acro-narcotic poison, and that they are preferred to *Dhatura* as a poison, when rapid effect is desired. No mention is made of the plant in Indian medical works; indeed, it would appear to be more widely known as a poison than esteemed as a drug.

Six ounces of the dry herb yielded to rectified spirit half an ounce of dark brown resinous extract (Dymock).

703. *Codonopsis ovata*, Benth. H.F.B.I., III. 433.

Vern.:—Ludût (Chenab).

Habitat:—Western Himalaya, from Kashmir to Garhwal.

Perennial herbs. Root woody, fusiform, large. Stem, 6-12 in., decumbent, then erect. Leaves ovate hairy both surfaces, alternate and opposite, obtuse or acute, $\frac{1}{2}$ - $\frac{3}{4}$ by $\frac{1}{8}$ - $\frac{1}{2}$ in., petiole $\frac{1}{8}$ - $\frac{1}{4}$ in. Peduncles 3-6 in., terminal. Calyx-lobes elliptic oblong, $\frac{1}{8}$ - $\frac{1}{4}$ in. approximate at base, minutely pilose. Corolla: broadly campanulate 1-1 $\frac{1}{4}$ by $\frac{1}{3}$ - $\frac{2}{3}$ in. widened upwards, sky-blue. Capsule depressed, obconic, $\frac{1}{8}$ - $\frac{1}{4}$ in. broad; beak $\frac{1}{2}$ in. long. Seeds narrowly ellipsoid, $\frac{1}{16}$ in. long.

Use:—The roots and leaves are made into poultices and employed in the treatment of bruises, ulcers, and wounds (Aitchison).

N. O. ERICACEÆ.

704. *Gaultheria fragrantissima*, Wall., H.F.B.I., III. 457.

Habitat:—On the mountains of N. and S. India, Nepal to Bhutan; gregarious in the Nilgiri, Travancore Hills, Burma, Ceylon, upper zone.

A large stout shrub in India, usually small low and much

branched in Ceylon. Bark very thin, shining, light brown. Orange-brown, says Trimen, twigs pink; young parts glabrous. Wood light-brown, moderately hard. Branches glabrous, more or less trigonous. Leaves 3 by 1-1½ in., lanceolate elliptic or elliptic-oblong to ovate, not acuminate, numerous persistent coriaceous, rounded at base, obtuse, serrate glabrous, stiff; venation reticulate, conspicuous, bright-green, rather glaucous, and with scattered sunk glands beneath, faintly aromatic when bruised, yielding an essential oil, from which salicylic acid and carbolic can be made (Dymock's *Phar. Indica*, Vol. II pp. 325-328), Petiole $\frac{1}{8}$ - $\frac{1}{4}$ in. (C. B. Clarke). $\frac{1}{8}$ - $\frac{1}{4}$ in., secondary nerves 3-7 pair, the 2nd and 3rd pair reaching beyond half the length of the leaf (Brandis). Flowers white, numerous, rather small, on short drooping pedicels. Dimorphic flowers, with short stamens and sterile anthers, not horned (Brandis); a pair of bractlets below the flower, and a bract at base closely placed in dense pubescent axillary racemes, 1-3 in., much shorter than leaves. Calyx white, segments acute; anther-spurs very sharp, reflexed. Ovary pubescent. Capsule small, $\frac{1}{2}$ in. diam., pubescent, completely enclosed in fleshy ovoid enlarged edible calyx, which is $\frac{1}{2}$ - $\frac{1}{2}$ inch long, smooth shining, deep-purple-blue.

Part used:—The oil obtained from leaves.

Use:—The oil is aromatic, stimulant and carminative. It has been given with success in acute rheumatism and sciatica, its properties corresponding to those of the salicylates, in doses of 10 minims gradually increased, preferably in capsules. The oil is also applied externally in liniments, or in the form of a suitable onitment. It has powerful antiseptic properties.

Mr. Broughton, the late Government Quinologist at the Neilgherries, in a report to the Madras Government on the subject of this oil, says:—"the oil from this source contains less of the peculiar hydrocarbon which forms a natural and considerable admixture with the Canadian oil, and therefore is somewhat superior in quality to the latter. The commercial demand for the oil is not, however, considerable enough to make its occurrence in India of much direct importance.

"It occurred to me in 1869 that methyl-salicylic acid would, however, under suitable treatment, furnish carbolic acid according to a decomposition described by Gerhardt. After a few experiments I was successful in preparing considerable quantities of pure carbolic acid. The method of manufacture is as follows:—The oil is heated with a dilute solution of caustic alkali, by

which means it is saponified and dissolved, methylic alcohol of great purity being liberated. The solution of the oil is then decomposed by any mineral acid, when beautiful crystals of salicylic acid are formed. These are gathered, squeezed, and dried. They are then mixed with common quicklime or sand, and distilled in an iron retort; carbolic acid of great purity, and crystallizing with the greatest readiness, passes into the receiver. This acid is equal to the purest kind obtained from coal tar, and employed in medicine. It, of course, possesses all the qualities which have rendered this substance almost indispensable in modern medical and surgical practice. I had hoped, from the inexhaustible abundance with which the plant grows on the Neilgherries, that the carbolic acid from this source could be prepared at less cost than that imported. I have not yet had an opportunity of working on a large scale with an itinerant still, as would be necessary for its cheapest production; but from some calculations I have lately made, I am led to think it can scarcely be prepared for less than the price of that procured from coal-tar. The purest kinds from the latter source cost four shillings a pound; I estimate the cost of that from this indigenous source at from Rs. 2-8 to Rs. 3-8 per pound in this country. The carbolic acid from the same source has certain advantages over the coal-tar acid, consequent on its extreme purity. It is less deliquescent, and cannot possibly be open to the suspicion of contamination with certain other products of coal-tar which possess injurious qualities.

"In conclusion I am led to the belief that it would not be advisable to prepare carbolic acid from this singular source, when the comparative cost shows that the gain must be very small or non-existent. But it appears to me well worthy of record, that should circumstances render the supply of the English product difficult or uncertain, as in the case of war, or the English price increase, a practically inexhaustible source exists in this country from which this indispensable substance, in its purest state, can be obtained at a slight enhancement of the present price." (Confer. Pharm. Journ., Oct 1871.)

705. *Pieris ovalifolia*, D. Don. H.F.B.I., III. 460.

Syn.:—*Andromeda ovalifolia*, Wall.

Vern.:—Ayâr (H.); Ayatta, eilan, ellal, arur, arwân (Pb.); Anjir, angiar, jagguchal (Nepal); Piazay (Bhutia); Kangshior (Lepcha).

Habitat:—Temperate Himalaya, from Kashmir to Bhotan and the Khasia Mountains.

A deciduous tree. Bark thick, fibrous, peeling off in long narrow stripes, deeply cleft, the clefts often extending spirally round the stem. Wood light, reddish-brown, soft, even-grained, but warps badly. Height 20-40ft. Leaves 3-7 by 1-4in., ovate-elliptic oblong, acute or acuminate, entire, rounded at the base,

coriaceous, glabrous, often pilose beneath when young, petiole $\frac{1}{8}$ - $\frac{1}{2}$ in. Racemes axillary, simple, rarely falsely paniced by the suppression of leaves towards the ends of the branches (C. B. Clarke), more or less pubescent. Pedicels $\frac{1}{8}$ - $\frac{1}{3}$ in. long. Bracts $\frac{1}{2}$ in., lanceolate or linear, deciduous. Flowers white; "sometimes pink or bluish," says Brandis. Calyx-lobes 5, triangular lanceolate, $\frac{1}{10}$ - $\frac{1}{8}$ in., connate at the base. Corolla $\frac{1}{3}$ - $\frac{1}{2}$ in. or $\frac{1}{2}$ - $\frac{2}{3}$ in. long, elongate ovoid, pubescent without; lobes 5, short, recurved. Stamens 10, hypogynous; filaments subulate, ciliate, with two filiform appendages, called "horns," at the apex; anthers open by terminal pores. Ovary 5-celled, ovules many in each cell. Capsule $\frac{1}{2}$ in. diam., globose, loculicidally 5-valved; seeds many, minute, linear-oblong (Kanjilal).

Use:—The young leaves and buds are poisonous to goats, they are used to kill insects, and an infusion of them is applied in cutaneous diseases (Gamble).

706. *Rhododendron arboreum*, Sm. H.F.B.I. III., 465.

Syn:—*R. puniceum*, Roxb. 373.

Vern:—Ardáwal, mandál, chiu, áru, brás, broâ, chacheon (Pb.); Chhán (Hazara); Ardáwal, mandál, chiu, bras (Himalayan names); Trikhgandera (Trans-Indus); Billi, pumaram (Nilghiris); Brus (Kumaun); Bhorans, gurás, ghonás, taggu, lalgurás (Nepal); Etok (Lepcha).

Habitat:—Temperate Himalaya, from Kashmir to Bhotan, and the Khasia Mountains.

An evergreen tree, 25ft. Bark lin. thick, reddish brown, peeling off in small flakes. Wood soft, reddish-white, or reddish-brown, close and even-grained, apt to warp and shrink. Leaves crowded at end of branches, 4-6 in. long, lanceolate or elliptic-oblong, acute at both ends, coriaceous, glabrous above, rusty-tomentose or covered with small silvery scales beneath. Nerves and midrib prominent beneath, depressed above; buds viscous. Flowers large, very showy, commonly deeply crimson, rarely pink or nearly white, in corymbose fascicles at the ends of the branches. Pedicels 0-to $\frac{1}{2}$ the length of the Corolla-tube.

Bracts hairy. Calyx-lobes $\frac{1}{10}$ in., wide, ovate or very obscure. Corolla campanulate, $1-1\frac{1}{2}$ in. by $\frac{3}{4}$ -lin. Lobes 5, often unequal. Stamens 10, alternately longer. Ovary woolly, 7-9-celled. Capsule 1 in. long, cylindric, curved, longitudinally ribbed. Seeds ellipsoid. Testa scarcely lax, except produced at the end.

Use:—The young leaves are poisonous. They are also medicinal, and applied to the forehead for headache (Dr. Stewart).

The honey of the wild bee is said, in Sikkim, to be poisonous at the flowering time of this species (Watt.)

The flowers which are sour to taste are eaten and made into a preserve, says Kanjilal.

707. *R. campanulatum*, Don., H.F.B.I., III. 466.

Vern.:—Gaggar (Kashmir); Chimul (Kumaun); Sarngar, shinwala, shargar, simrung (Himalayan names); Cherialu (Nepal).

Habitat:—Alpine Himalaya, from Kashmir to Bhotan.

A moderate-sized, evergreen shrub, 6-16 ft., with thin grey bark. Leaves 3-5 in. long, elliptic or elliptic-oblong, rounded at both ends, crowded at the ends of the branches, mucronate, coriaceous, glabrous and finely reticulate above, with a dense cinnamon colour tomentum, concealing the nerves beneath; midrib prominent. Flowers large and showy, whitish pink, purple or lilac, in lax terminal corymbs; pedicels as long as Corolla-tube; bracts 1 in., broad—oblong, silky. Calyx-teeth broadly triangular, very small, scarcely $\frac{1}{2}$ in. Corolla campanulate, $1-1\frac{1}{2}$ by $\frac{3}{4}$ -lin.; lobes 5. Stamens 10. Ovary 5-9-celled, glabrous. Style persistent. Capsules cylindrical, seeds linear-oblong, compressed.

Uses:—The leaves are poisonous to goats. Mixed with tobacco, it is made into a medicinal snuff, useful in colds and hemicrania. They are also used in chronic rheumatism, syphilis and sciatica. The dried twigs and wood are used in Nepal as a medicine in phthisis and chronic fevers, (Watt).

708. *R. lepidotum*, Wall., H.F.B.I., III. 471.

Vern.:—Tsaluma, tsuma (Bhutia); Talis fur (Northern Ind.); Taliori (Simla).

Habitat:—Temperate and Alpine Himalaya, from Kashmir to Bhotan.

A small, aromatic shrub, young parts covered with glandular scales. Leaves $\frac{7}{10}$ -lin. long, approximate at the ends of branches, sessile or subsessile, obovate or obtuse, or lanceolate and subacute; glabrous above, silvery or brown tomentose beneath. Flowers red, yellow or purple, solitary or 2-3 together; pedicels $\frac{1}{2}$ -1 $\frac{1}{2}$ in. long, very scabrous. Calyx-lobes oval, not ciliate. Corolla-tube short; lobes round, spreading, $\frac{1}{3}$ - $\frac{1}{2}$ in. long. Stamens usually 8. Ovary 5-celled. Capsule 5-celled, $\frac{1}{2}$ by $\frac{1}{3}$ in. Seeds oblong, acute.

Use:—To it are attributed the same medicinal properties as to *R. Anthopogon*.

709. *R. setosum*, Don., H.F.B.I., III. 472.

Vern.:—Tsallu (Bhutia and Tibetan).

Habitat:—Sikkim and Nepal.

A small shrub, 1 ft. Branchlets bristly. Leaves $\frac{1}{2}$ by $\frac{1}{4}$ in., elliptic obovate, obtuse, scaly on both surfaces and often bristly beneath. Pedicels $\frac{1}{4}$ in., glandular, scaly, 3-8-clustered, short. Calyx-lobes $\frac{1}{8}$ - $\frac{1}{4}$ by $\frac{1}{8}$ - $\frac{1}{6}$ in., obtuse, glandular, scaly, elliptic. Corolla red, tube very short, $\frac{1}{8}$ in., lobes $\frac{1}{2}$ by $\frac{1}{4}$ in., oblong spreading. Stamens 8, sometimes 10; filaments hairy below. Ovary 5-celled, glandular, scaly. Capsule $\frac{1}{4}$ by $\frac{1}{3}$ in., ovoid, hardly larger than the Calyx-lobes. Seeds ellipsoid, subacute at the ends; testa close, not produced.

Use:—"The Sikkim Bhutias and Tibetans attribute the oppression and headaches attending the crossing of the loftiest passes to the strongly resinous odour of this and *R. anthopogon*. A useful volatile oil, of no less marked character than that of the American gaultheria, might probably be obtained from the foliage by distillation" (Hooker).

710. *R. Anthopogon*, D. Don., H.F.B.I., III. 472.

Vern.:—Nichni, rattankát, nera (Jhelum); Tazak-tsum; Talis-far (Kashmir); Pálu (Bhutia).

Habitat:—Alpine Himalaya, from Kashmir to Bhotan.

A small shrub, with aromatic odour; 1ft. Branchlets scabrous and scaly. Leaves 1-1½ in. long, elliptic or broad-oblong, shining above, broad-tomentose, and as it were tomentose from the layer of glands, petiole ½-¾ in. long. Flowers yellow, in dense terminal corymbs. Calyx-lobes oblong or elliptic membranous, ciliate. Corolla tubular, with a dilated mouth; tube ¾ in. long; lobes obovate, entire, spreading. Stamens 6-8; Ovary scaly. Capsule ½ in. long, ovoid. Seeds oblong, subacute. Testa lax, not produced even at the ends.

Uses:—The leaves are aromatic, and their smoke is considered useful in some diseases. They are supposed to have stimulant properties (Stewart). The leaves are administered as errhine to produce sneezing (Honnigberger).

This is one of the species which is thought by the Bhutias to excite the headache and nausea which attends ascents to the high elevations of the Eastern Himalaya. (Sir J. D. Hooker.)

711. *R. cinnabarinum*, Hook. f. H.F.B.I., III. 474.

Vern.:—Búlú (Nepal); Kema, kechung (Lepcha).

Habitat:—Eastern Himalaya, Sikkim and Bhutan.

A large shrub, 4-8ft. Bark thin, reddish-grey. Wood light-greyish or yellowish-white, moderately hard, even-grained, warps. Leaves 2-3 by 1-1½ in., acute or obtuse, beneath nearly white or cinnamoneous, with scattered gland scales, oblong or elliptic. Petioles terminal or clustered, ½-¾ in. Pedicels ¼-½ in., squamous or glabrous. Bracts glabrous, with ciliate margins. Flowers, says C. B. Clarke, orange-rose or brick-red. Flowers scarlet, says Gamble; orange or brick red says Brandis. Calyx-lobes small, unequal or obsolete. Corolla-tube long, narrow, campanulate, lobes ovate, 1¼ by ⅓ in., pendulous. Stamens 10. Filaments pilose at base. Ovary 5-celled, glandular scaly. Capsule ½-¾ by ¼ in. Seeds ovoid or trigonous. Testa close, hardly produced at all. A most variable plant, says Clarke.

Use:—The leaves are universally considered poisonous to cattle and goats. If employed as fuel, the smoke causes eyes to inflame and the face to swell (Hooker).

N. O. PLUMBAGINEÆ

712. *Plumbago zeylanica*, Linn., H.F.B.I., III. 480; Roxb. 155.

Sans.:—Agni-shikhâ, Chitraka. (Also Vahni, and all the other names of fire. Roxburgh).

Vern.:—Chitrâ, chîta, chitarak (Hind.); Chítú (Beng.); Shitaraj (Arab.); Shitaruk (Pers.); Chatrmûl, Chitrakmûl, (Dec.); Venchittira (Tam.); Tella-chitra (Tel.); Kotuvéli (Mal.); Sudunitul (Cingh.); Kn-khen-phín (Burm.); Chitrak (Bom.).

Habitat:—Cultivated, and wild throughout India. Common in Bengal, South India, and Kumaun hills.

An evergreen perennial herb, or undershrub, diffuse, rambling. Stems several, 2-5ft., cylindric, glabrous striate. Root long, succulent, often much contorted, substantial, diffuse, straited longitudinally, 4-5ft. long, procumbent branches, on reaching the soil, often strike root. Leaves alternate, exstipulate, entire sessile, $1\frac{1}{2}$ - $3\frac{1}{2}$ in. long, 1in. broad, ovate. Petiole $\frac{3}{4}$ in., base dilated, amplexicaul. Spikes 4-12in., often branched; rachis of the spike pubescent or glandular. Flowers white, scentless, regular, bisexual, in long spike-like racemes, the rachis glandular, striate. Bracts and bracteoles persistent, leafy, shorter than the Calyx. Calyx inferior, free, $\frac{1}{2}$ - $\frac{1}{3}$ in. by $\frac{1}{10}$ in., persistent, narrowly tubular or spindle-shaped; 5-10 ribbed, often hyaline between the ribs, mouth frequently funnel-shaped, scarious; segments five, with membranous margins, covered with short, large, stalked, spreading, globose, crimson glands; teeth very short. Corolla inferior, persistent, tubular; tube 1in., slender; lobes 5, spreading, nearly $\frac{1}{2}$ in. long, oval ovate or ovoid, acute. Stamens 5, free, hypogynous, opposite the petals; filaments free, as long as the Corolla-tube, linear, dilated at base; anthers protruded, 2-celled. Ovary superior, 1-celled, 5-angular, narrowed at apex. Style simple filiform, divided into 5 stigmatose branches, nearly throughout the length. Stigmas 5, capillary and quite distinct. Ovule solitary. Capsule membranous, oblong, sharply pointed, included within the persistent Calyx and Corolla; pericarp thickened above. Dehiscence circumsciss near the base. Seed cylindrical or oblong rotund.

Uses.—"The root of *P. zeylanica* is said to increase the digestive power, to promote the appetite, and to be useful in dyspepsia, piles, anasarca, diarrhoea, skin diseases, &c." (Hindu Mat. Med.). "A tincture of the root-bark has been employed as an antiperiodic. Dr. Oswald says that he has employed it in the treatment of intermittents with good effect. It acts as a powerful sudorific." (Pharm. Ind., p. 1701.)

Mahomedan writers describe it as caustic and vesicant, an expellant of phlegmatic humors; useful in rheumatism and spleen, digestive; it also causes abortion. For external administration, it is made into a paste with milk, vinegar or salt and water. Such a paste may be applied externally in leprosy and other skin diseases of an obstinate character, and be allowed to remain until a blister has formed

In the Concan, the following formula is used:—Chitrak root, Emblic myrobalans, small black myrobalans (Bal-hartaki), long pepper, pepper root, rhubarb and rock salt. Powder and give 6 mássás with hot water every night at bed time, in flatulence with rheumatic pains (Dymock).

Taylor comments on its sialogogue properties. The milky juice is used as an application to unhealthy ulcers and in cases of scabies. (Dr. Thorat in Watt's Dictionary.)

713. *P. rosea*, Linn., H.F.B.I., III. 481; Roxb. 155.

Sans.:—Rakta chitraka.

Vern.:—Lal-chitra (H.); Rakto-chitá (B.); Lál-chitrakmúl (Dec.); Sheucodie vayalie, Shivappu-chittira (Tam.); Yerracithra-moolum (Tel.); Schettie-codivalie; Choovonda-coduavale (Mal.).

Habitat.:—Valleys in Sikkim and Khasia, often cultivated in gardens.

An evergreen, perennial shrub, 2-4ft. high, "very rarely annual" (Boissier). The plant when grown in gardens and conservatories is much more handsome than when it grows under a blazing sun, whereby its leaves invariably suffer in form and substance. Root fibrous, outwardly dusky-yellow or greenish, according to Rumphius. On section yellowish, when fresh,

with a brown tinge in the axis-line. When mature, it is woody and solid ; sinuous and nodose near the stem, sending down into the soil many thick fibrillæ. Sometimes the root is 2ft. long. Leaves entire, alternate, slightly drooping, glabrous, undulate or wavy, elliptic, ovate, lanceolate or oblong-rotund ; ribs prominent on the ventral surface ; margin of tender leaves distinctly red all round. Petioles very short, channelled, sometimes amplexicaul ; sometimes absent ; margins red. Stipules absent. Flowers odourless, in terminal or axillary spikes (racemes) 1-2ft. long. Rachis of the spike glabrous. Bracts 2, superior, lateral, 3, says Rheede, glabrous, foliaceous. Rheede's description seems to me to be more accurate (K. R. Kirtikar) ; the bracteoles are persistent. Calyx sessile, inferior, gamosepalous, tubular, herbaceous, covered with stalked, sticky scarlet glands throughout its length, 5-10-ribbed ; upper half bright-red, often deep rose-coloured, lower half brown-red, with just a shade of green near the insertion of the bracteole. If the pedicel is at all present, it is very short, oblong and deeply imbedded in the bracteoles. Corolla bright-red, often deep rose-coloured, hypercratiform, hypogynous tube long, slender, slightly angular, lobes 5, obovate or obcordate, usually the latter ; stamens 5, opposite the petals, free, very fine, and delicate, pale-rose-coloured, partly whitish, slightly arising above the " throat " of the Corolla-tube and looking purplish. Filaments filiform, linear, dilated at base and inserted at the base of the petals into the tops of 5 nectrial scales (Roxb.). Anthers oblong, introse ; anther-cells separated at base, opening by longitudinal slits. Pollen ovate. Ovary free, sessile, superior, 5-angular above, or 5-gibbous, as Boissier terms it ; narrowed at apex. Style single, slender, whitish, with 5 small segments quite indiscernible and alternating with the stamens. Base of style hairy. The union of the segments is a diagnostic character of this plant. Stigmas 5, capillary, furnished on their inner surface with several lines of glands. Ovule 1. Fruit a membranous capsule, circumsciss. Blume says the Dehiscence is valvate, others say that the Dehiscence is subvalvate. Seed cylindric or oblong, rotund, with 5 longitudinal striæ.

" Altogether resembling *P. Zeylanica* and perhaps only a cultivated variety of it " (C. B. Clarke).

Roxburgh says:—"The specific distinguishing marks between two species, according to my observation, depend on the racemes and bracts, color not being a specific mark."

Uses:—Mentioned by Sanskrit and Mahomedan writers as an abortifacient and vesicant.

The bruised root of this plant is, in its natural state, acrid and stimulating, but when tempered with a little bland oil it is used as an external application in rheumatic and paralytic affections; it is also prescribed internally in small doses for the same complaints, in combination with some other simple powder (Ainslie.)

The vesicant properties of the root of this plant were known to the old writers, but it was O'Shaughnessy who first tried this drug in between three hundred and four hundred cases, and found out that the root-bark, being rubbed with water into a paste and applied to skin, raised blisters within twelve or eighteen hours; and that it can be used as a cheap substitute for Cantharides, with the additional advantage of causing no irritation of the genito-urinary organs. When administered internally it acts as a stimulant, and in large doses as an acro-narcotic poison. "It is one of the articles in use amongst the natives for procuring abortion. For this purpose, the scraped root-bark is introduced *per vaginam* into the *os uteri*." Death is often the inevitable consequence of the use of this substance in the manner specified. The root is also used as a powerful sialogogue. In South India, the dried root is highly valued as a remedy for secondary syphilis and leprosy (Pharm. Ind., p. 169). See K. R. Kirtikar's remarks in his *Poisonous Plants of Bombay*.

Dr. Waring found that it caused more pain than an ordinary blister, and that the resulting vesication was less uniform, and not always easily healed. From what I have seen of its use, I am inclined to support Dr. Waring's opinion (Dymock).

"The milky juice is useful in ophthalmia" (Asst.-Surg. T. N. Ghose. The milky juice is useful as an external application for scabies (Surg. Mukerji.) Its vesicating properties have been successfully utilized in curing certain cases of leucoderma (Surgeon-Major Gray, in Watt's Dictionary).

N. O. PRIMULACEÆ.

714. *Primula reticulata*, Wall. H.F.B.I., III. 483.

Syn. :—*P. altissima* and *P. speedosa*, Don.

Vern. :—Biskopra, Jal-kutra (Kumaon.)

Habitat :—Central and Eastern Himalaya, Nepal and Sikkim.

A perennial, scapigerous herb, glabrous, slightly mealy or not. Rost-stock small. Leaves very long—petioled, 2-3 in., oblong-cordate, very slender obtuse, crenate or doubly crenate, reticulate, glaucous beneath, petiole 4-6in. Scape very tall, slender, 12-16in. Inflorescence sometimes mealy. Bracts large, regularly placed but unequal in size, sometimes toothed. Linear-oblong or lanceolate. Flowers nodding, slightly fragrant. Calyx $\frac{1}{4}$ - $\frac{1}{2}$ in., campanulate; calyx-lobes short, acute, recurved, quite terete or 5-ribbed. Corolla-tube yellow, funnel-shaped; much exserted, nearly $\frac{1}{2}$ in., lobes erecto-patent, small, rounded or notched. Fruit not seen, says J. D. Hooker.

Use :—Said to be poisonous to cattle; is used externally as an anodyne (Atkinson). The same remark might easily apply to any species of *Primula*.

715. *Anagallis arvensis*, Linn. H.F.B.I., III. 506.

Vern. :—Jonkhmári, Jainghani (N.-W. P.); Magnues baghee, Dhabbar (Pb.)

Eng :—Poor man's weather glass.

Habitat :—Bengal, North-West India, and the Himalaya, from Nepal westwards. Central India and Nilgherry Hills. Found occasionally in the Deccan in moist places, and is common in the Pashan valley.

An annual, erect, or procumbent herb, glabrous, gland-dotted, branching from the base. Branches 4-angled, ascending, 5-15in. long. Leaves $\frac{1}{2}$ -1 $\frac{1}{2}$ in., sessile, ovate, cordate or lanceolate, acute, gland dotted, rarely whorled. Peduncles 1-2in., erect in flower, decurved in fruit. Sepals narrow, acuminate, lanceolate, almost

equalling the blue or red corolla. Corolla $\frac{1}{3}$ - $\frac{1}{2}$ in. diam., closing in dull weather, segments often ciliate. Capsule about $\frac{1}{2}$ in. in diam, dehiscing transversely in the middle; sttyle persistent. Seeds 3-gonous.

Uses :—Used to intoxicate fish and to expel leeches from the nostrils. For this purpose the juice of the various species of *Begonia* would seem admirably suited. It is also used in cerebral affections, leprosy, hydrophobia, dropsy, epilepsy, and mania. Formerly it was used in Europe in epilepsy, mania, hysteria, delirium, enlargement of the liver, spleen, dropsy, emaciation, stone, the plague, bites of serpents and mad animals, and in numerous other diseases (Honnigberger).

Said to be poisonous to dogs, producing inflammation of the stomach (Baden-Powell's P. P., I. 368).

Now it is not used in Europe or Asia. "What a pity that such a remedy should have been suffered to pass into oblivion" (Honnigberger).

N. O. MYRSINÆ.

716. *Myrsine africana*, Linn. H.F.B.I., III. 511.

Vern. :—Bebrang, kakhum, kokhúri, gugul, bandáru, atuljan (Pb.); Guvaini, Pahari chá, Chapra (U. P.)

Habitat :—Himalaya, from Kashmir and the Salt Range to Nepal.

A small, evergreen, pubescent shrub, sometimes soft. Bark thin, dark-brown, with large lenticels. Wood light-brown, moderately hard. Bractlets and petioles ferruginous-pubescent. Leaves nearly sessile, lanceolate, $\frac{1}{2}$ -1 in., sharply toothed, midrib prominent. Flowers nearly sessile, small in axillary fascicles; in clusters of 3-8, less than $\frac{1}{2}$ in. diam. Calyx and Corolla 4-lobed, 5-merous. Stamens 4. Anthers exceeding corolla, style short; stigma capitate, covered with minute protuberances. Berry dotted with red glands, usually solitary, smooth, says Kanjilal; $\frac{1}{10}$ in. diam., swelling when full ripe. Berry, says Clarke, $\frac{1}{8}$ - $\frac{1}{6}$ in. diam.; style branches 2-4, spatulate.

Use.—Fruit used as an anthelmintic (especially for tapeworm), sold under the name of *Bebrang*, and often used as a substitute for that of *Samara Ribes* (Stewart).

It is also laxative in dropsy and colic. The gum of this plant is a warm remedy for dysmenorrhœa (Balfour).

Continued use is said to produce a high-colored state of urine.

717. *Embelia Ribes*, *Burm. H.F.B.I.*, III. 513 ;
Roxb. 195.

Syn. :—*E. glandulifera*, *Wight*.

Sans. :—*Vidanga*.

Vern. :—*Baberang*, *wawrung* (Hind.) ; *Bebrang* (Sylhet) ; *Himalcheri* (Nepal) ; *Babrung* (Pb.) ; *Váyu-vilamgam* (Tam.) ; *Kár-kannie*, *Warding* (Bom.) ; *Umbelia* (Cingh.).

Habitat :—From the Central Himalaya, throughout India ; common in the lower hills.

A large, scandent shrub. Bark, tubercled, $\frac{1}{2}$ in., rough, with conical hard protuberances. Wood light-brown, porous. Climbing by means of reflexed lateral twigs, which are deciduous except at the basal part, which remains as a woody deflexed spine. Branches extremely long, very flexible, with long internodes, slender, cylindric ; bark of young branches nearly white, very smooth and shining, with large lenticels. Leaves 4-5 in., on very short petioles, usually bordered with prominent glands, lanceolate or oblong-lanceolate, acute or rounded at base, shortly acuminate, acute or obtuse, entire, perfectly glabrous and shining on both sides, pale and somewhat silvery beneath, coriaceous ; lateral veins invisible, white surface, with scattered minute, red, sunken glands. Flowers very small, $\frac{1}{4}$ in., numerous, or white, more or less pubescent, in lax elongated, spreading pubescent panicles, 6 in-2 ft. long, terminal or in axils of upper leaves ; bracts small, ciliate. Corolla split into distinct petals, pubescent on both sides. Stamens 5, erect. Berry about $\frac{1}{4}$ in., nearly globose, tipped with style, smooth, crimson, wrinkled when dry.

Uses :—Sushruta describes the fruit as anthelmintic, alterative and tonic, and recommends their use along with liquorice root, for the purpose of strengthening the body and preventing the effects of age. Later writers regard it as carminative, stomachic, anthelmintic, and useful against intestinal worms, dyspepsia, and skin diseases. The berries enter into the composition of several applications for ringworm and other skin diseases (Dutt).

The Hakims consider it to be attenuant and a purgative of phlegmatic humors; also a valuable anthelmintic, especially against tape-worms (Dymock).

“Vaivarang is common in the neighbourhood of Bombay, and is in high repute as an anthelmintic among the country people, especially in cases of tape-worm. The dose is a teaspoonful of the powder, twice a day for a child, and a dessert-spoonful for an adult; it can hardly be called a purgative; the taste is rather pleasant, slightly astringent, and faintly aromatic. The worm is expelled dead. A purgative should be given to prepare the patient for the drug. It is a common practice to put a few berries of the plant in the milk that is given to young children; they are supposed to prevent flatulence (Dymock).

Dr. Warden has separated an acid, named embelic acid, from the seeds.

This drug would seem to richly deserve being experimented with in Europe. It is an undoubted anthelmintic, quite devoid of the nauseating property possessed by male fern (Watt).

180 grains (a tola) of the powdered seeds administered at bed time in curdled milk, followed by a dose of castor oil on the following morning, has been found an efficacious remedy in tapeworm (Sakharam Arjun).

718. *E. robusta*, Roxb., H.F.B.I., III. 515; Roxb. 197.

Vern. :—Bayabirang (Hind.); Kalay bogoti (Nepal); Bebrang (Oudh); Baya birang; gaia (Dehra Dun), Kopadalli (Gond.); Bharangeli (Kurku); Amti, ambat, barbatti (Bom.).

Habitat :—From the Himalaya, throughout India

A shrub or small tree, semi-scandent, by means of its numerous horizontal branchlets. Bark grey, with horizontal cracks and numerous leaticels; young parts glabrous. Leaves 2-4in., oval or broadly oval, acute or rounded at base, somewhat acuminate, subacute or obtuse, entire, rather undulate, thin, glabrous, pale and often reddish beneath, veins purple, the lateral ones conspicuous. Petiole $\frac{1}{2}$ - $\frac{3}{4}$ in.; channelled above, papillose flowers 5-merous, small, pale yellowish green, on sharp divaricate pedicels, in small axillary and terminal racemes or panicles, shorter than the leaves. Bracts minute. Calyx puberulous, segments lanceolate, acute. Corolla cut nearly to the base, lobes 5-recurved, puberulous on both sides. Berry about $\frac{1}{8}$ in., nearly globose, apiculate, red, pulp scanty.

Kanjilal, says "Flowers dioecious; seed usually solitary, globose, with a hollowed base."

Uses:—The fruit is said to adulterate black pepper. It is given as an anthelmintic, and internally for piles.

The young leaves, in combination with ginger, are used as gargle in cases of sore-throat; that the dried bark of the root is a reputed remedy for toothache, and that the berries, mixed with butter, are used as an ointment, which is applied to the forehead as a specific for pleuritis (Treasury of Botany).

Sometimes used as an antispasmodic and carminative (Surgeon-Major McCanna, in Watt's Dictionary).

719. *Ardisia colorata*, Roxb., H.F.B.I., III. 520, Roxb. 195.

Habitat:—A shrub, frequent in Aasam, Cachar to Mallaca.

A small, evergreen tree, attaining 25ft. Branches round, becoming flattened, only close under the panicle. Branchlets and underside of leaves covered with often shining scales. Leaves lanceolate-oblong, acute at both ends, 9 by $2\frac{1}{2}$ in., parallel-sided, glabrous, coriaceous; base cuneate, petiole $\frac{1}{2}$ in., primary nerves nearly at right angles to the midrib. Panicles glabrous or obscurely rusty, 6-12in., divided 2 or 3 times, branches flat-

tened. Pedicels $\frac{1}{8}$ - $\frac{1}{4}$ in., densely umbelled, glabrous or minutely puberulous; buds $\frac{1}{2}$ in. long. Flowers small, Calyx teeth, $\frac{1}{16}$ in., elliptic oblong; petals $\frac{1}{2}$ in.; style $\frac{1}{2}$ in., much longer than the Corolla. Berry $\frac{1}{2}$ in., globose, smooth, deep-red to black.

Use:—Said to be the *dan* of Ceylon, the bark of which is used as a febrifuge in fever and in diarrhœa, and also applied externally to ulcers (Watt's Dictionary, I. 290).

N. O. SAPOTACEÆ.

720. *Achras sapota*, Linn., H.F.B.I., III. 534.

Vern.:—Chikku (the fruit) (Bomb.); Sapotá (H. and B.); Shimai-eluppai (Tam.); Sima-ippa (Tel.); Kumpole (Kan.); Chakchakoti-kajhár (Duk.).

Habitat:—Cultivated in many parts of India.

A native of Tropical America, much cultivated in Indian gardens, most excellent luscious fruit, which should be eaten when slightly overripe, as says Gamble, in which I quite agree with him (K. R. K.). C. B. Clarke says that fruiting branchlets, communicated by Mr. Cantley from Perak, of a tree 80-100 ft. high, yielded gutta plentifully. The wood is reddish brown, hard, with radial groups of pores in oblique patches, fine medullary rays and irregular narrow, wavy, transverse lines (Gamble). Leaves crowded near the ends of thick branchlets, shining, elliptic-lanceolate; blade 3-6 in. Petiole slender, $\frac{1}{2}$ -1 in. long. Flowers 6-merous, whitish; stamens 6, alternately with lanceolate staminodes, resembling the corolla-lobes. Ovary 12-celled. Fruit as large as an orange, rind rough, brown, thin. Seeds 5 or more, some undeveloped ones sharp as needles. The fruit must, therefore, be carefully eaten, to avoid the sharp needle-like abortive seeds, at times about $\frac{1}{2}$ in. long, hurting the mouth or getting into the throat. Seeds black, shining, about $\frac{1}{2}$ in. long when mature.

Uses:—In the West Indies, the seeds are known to be aperient and diuretic, and the bark is reputed to be tonic and febrifuge. In the Concan, the fruit soaked in melted butter all

night and eaten in the morning, is considered to be an excellent preventive against biliousness and febrile attacks (Dymock).

From the kernels, are obtained.—

(A.) A glucoside, *Sapotin* $C_{29}H_{40}O_{20}$, microscopic crystals in appearance, burning taste, laevo-rotatory ($[\alpha]_D -321$ in alcoholic solution), soluble in water easily; in cold alcohol sparingly, easier in hot; insoluble in benzene, ether, chloroform. It melts at 240° with decomposition. With dilute sulphuric acid, it yields sugar and *Saporetin* $C_{17}H_{32}O_{10}$ which latter is soluble in alcohol and chloroform, insoluble in water and ether.

(B.) An alkaloid, *Sapotine* bitter in taste, insoluble in water and alkali, but soluble in alcohol, ether and chloroform.

The bark contains two resins, and a large proportion of *Sapotaunic acid* which is the cause of its astringency.

It is a gutta percha yielding plant. From it *Chiclegum* is obtained. The sample examined lost 2.33 per cent. when dried at 110° and gave 4.85 per cent. ash; water dissolved 17, alcohol 60, acetone 62, ether 76, and chloroform 77 per cent. of the drug.

Nothing is present that volatilises with steam. Water extracts a gum mixed with a little proteid substance, which was removed by means of tannic acid; the gum forms 9 per cent. of the drug; it is insoluble in alcohol, optically inactive, yields 3.76 per cent. ash, and gives the α -naphthol sulphuric acid reaction and the reactions for furfuraldehyde. No oxydase is present.

The drug was then extracted repeatedly with boiling alcohol; from the extracts, the alban crystallised on cooling. From the last extracts, *v-chiclaban*, $C_{15}H_{25}O$, was obtained in small quantity, equal to 0.5 per cent. of the drug; it is crystalline, and melts at $86-87^\circ$. The earlier extracts contained a small quantity, equal to 0.2 per cent. of the drug, of a substance sparingly soluble in alcohol at 50° and melting at $219-221^\circ$; this is *a-chiclaban*, $C_{24}H_{45}O$. The bulk of the alban consists of *B-chiclaban*, which crystallises in a variety of forms, and seems, when purest to form prismatic crystals or round plates which melt at 158° and have the composition $C_{13}H_{20}O$. No cinnamic or other acid was obtained by boiling either the drug or *B-chiclaban* with alcoholic potassium hydroxide; from the alban, however, a neutral crystalline substance, $C_{24}H_{44}O$, melting at $152-153^\circ$, was isolated. By concentrating the alcoholic mother-liquor from the alban and pouring it into very dilute hydrochloric acid, *chicla fluavil*, $C_{10}H_{20}O$ or $C_{10}H_{18}O$, was precipitated as a sticky, amorphous substance, which melts at $65-66^\circ$ when dry; the yield was 1.5 per cent. of the drug.

The residual drug was dissolved in chloroform and the solution poured into alcohol, when *chicla gutta*, $C_{10}H_{18}$, was precipitated; this was crystallised from ether. From the chloroform-alcoholic mother-liquor, *chiclabanan* separated gradually in small amount; after recrystallising from a mixture of alcohol and ether, it melts at $55-57^\circ$.

It is noteworthy that, as with gutta-percha and balata, the fluavil has the lowest, the albanan the highest, percentage of carbon, the alban being intermediate. J. Ch. S. LXXXVIII. pt. 2, p. 685.

721. *Bassia latifolia*, Roxb., H.F.B.I., III. 544 ;
Roxb. 411.

Sans. :—Madhuka.

Vern. :—Mahwá, mahuá, mahula, maul (H. and B.); Moha (Uriya); Mandukum (Kól.); Matkom (Santal.); Mahurá (Bhil); Irúp, irrip, irhu (Gond.); Mohu (Kurku); Mová, mahua, mohá (Bom.); Mahuda or Mahura (Guz.); Mowda, ránácha-móhácha-jháda, ránácha-ippécha-jháda, moho, maodá, mohá (Mar.); Illupi, elupa, kát illipi, káthi-iluppai, káttu-iluppai, káttu-irrupai (Tam.); Ippi, ippa, yeppa, adavi-ippe-chettu (Tel.); Hogue, hippe, kádu-ippe-gida (Kan.); Poonam, káttrippa banam (Mala).

Eng. :—The Butter or Mahuá tree.

Habitat :—Throughout Central India, from West Bengal to the Western Ghats; also wild in the Kumaon Terai.

A large, evergreen tree, says Gamble; "Deciduous," says Kanjilal; usually with a short trunk and rounded crown, young shoots, young leaves, stipules and pedicels tawny tomentose. Bark $\frac{1}{2}$ in. thick grey, or blackish with vertical cracks, the inner portion reddish or milky, exfoliating in thin scales. Wood from hard to very hard; sapwood large; heartwood reddish-brown. Branches many, spreading, forming a close symmetrical head. Leaves firm, clustered near ends of branches, 5-9 in. long, elliptic or oblong elliptic; main lateral nerves 10-12 pair, base cuneate, petiole 1-1 $\frac{1}{2}$ in. long. Stipules subulate, pubescent, soon falling. Flowers in dense clusters at the ends of branches, pedicels 1-2 in. long. Calyx $\frac{5}{8}$ in., divided nearly to the base, coriaceous, segments 4-5, densely tomentose outside. Corolla $\frac{3}{4}$ in. long, cream-coloured, fleshy, juicy, sweet, early caducous, tube ovoid, lobes short, erect, 7-4, usually 8-9, stamens 24-26, anthers subsessile, hairy at the back, inserted in 3 series inside the Calyx-tube. Ovary hirsute; style 1 in. or more in length, hairy at the base. Berry ovoid, fleshy, green, 1-2 in. long, 1-4-seeded, seeds $\frac{1}{2}$ -1 in. long.

Use :—The flowers yield a distilled spirit, which is described by Sushruta as heating, astringent, tonic and appetising. The flowers are regarded as cooling, tonic and nutritive. They

enter into the composition of several mixtures of a cooling and demulcent character (Dutt. Mat. Med. of the Hindus).

The fruit is eaten; yields, when expressed, a thick oil which is eaten and is also used to adulterate ghee, says Kanjilal.

The oil is much valued by the hill-tribes in the treatment of skin diseases.

The leaves are boiled in water, and given as a cure for several diseases; they make a good embrocation (Watt).

The bark is used in decoction as an astringent and tonic. (Irvine). It is sometimes used as a remedy for rheumatic affections. Voigt says, it is rubbed on the body as a cure for itch.

The dried flowers are used as a fomentation, in cases of orchitis for their sedative effect.

The flowers are used in coughs, in the form of a decoction. The medicinal properties attributed to this plant are stimulant, demulcent, and emollient, heating, astringent, tonic, and nutritive. The seeds yield, on expression, a thick concrete oil, which is recommended to be applied to the head in cephalalgia.

The spirit distilled from the flowers of *B. latifolia* (Baia or Mahwa Spirit) has a strong smoky odour, somewhat resembling Irish whiskey, and rather a pungent fetid flavour, which, however, disappears with age. The freshly distilled spirit proves very deleterious, exciting gastric irritation, and other unpleasant effects (See Dr. Gibson in *Hooker's Journ. Botany*, vol. v., p. 90). Sub-Assistant-Surgeon Odoy Chund Dutt reports having used the weaker (diluted?) spirit extensively; and in his opinion it is less injurious to the digestive system than rum, more resembling beer in its effects on the constitution, and nutrition of the body. This view is coincident with that of Dr. W. Wright. It is evidently a powerful diffusible stimulant, and, when matured by age, may be used as such, when brandy and other agents of the same class are not available. The residuum or cake left after the expression of the oil (*Ilú-pai pínak*, Tam.), is employed as an emetic. Some cases of poisoning by Stramonium, in which it was so employed, are given by Dr. J. Shortt (*Madras Quart. Med. Journ.*, vol. vi., p. 286). It appears to act efficiently in this character (Ph. Ind.)

Sugar of Mahwa flowers.—Previous investigators have stated that the dried flowers contain about 60 per cent. of a readily fermentable, partially crystallisable sugar, of which 4-17 per cent. is described as cane sugar. E. O. Von Lippmann has examined samples of this sugar extracted from the freshly fallen flowers by means of alcohol. They consisted of an upper layer of pale yellow faintly acid syrup and about two-thirds of very hard crystals resembling sugar candy. The syrupy portion was found to consist of invert sugar, containing only traces of cane sugar, whilst the crystals were also identified as pure, crystallised invert sugar. This observation is of interest, as it appears to be the first record of the occurrence of invert sugar in such large and well-defined crystals. Whether the flower, originally contained cane sugar or invert sugar is a question which can only be decided by analyses on the spot. (J. S. Ch. I. May 31, 1902. p. 713).

722. *B. longifolia*, Linn., H.F.B.I., III. 544;
Roxb 410.

Vern.:—Moha, mohva (Hind.); Mohuva (Beng.); Darakhtegulchakane (Pers.); Kat illupi, elupa (Tam.); Ippi, yeppa, pinna (Tel.); Mahwa, mohi (Bom.); Mahuda (Cutch); Mohácha-jháda, ippicha-jháda (Mar.); Mahudá, mová-nu-jháda (Guj.); Hippe, ippigridá (Kan.); Ellupi, irippa (Mal.).

Eng.:—The Mowa tree.

Habitat:—Western Peninsula, on the Ghâts from the Konkan southwards. Common in the moist forests of the Konkan and North Kanara; often along the banks of rivers and nálás; takes the place of *B. latifolia*, in the moist forests of the southern parts of the Bombay Presidency. (Talbot).

A large evergreen tree, young 50ft. high. Bark dark, yellowish grey, thick, slightly furrowed. Wood red, moderately hard, close grained. All young parts rusty-tomentose. Leaves clustered towards the ends of the branches. Leaves 4-5 by 1½ in., mature glabrescent, lanceolate at both ends. Primary nerves 12 on each side, distinct, secondary distinct. Petiole 1-1½ in. Stipules linear, pedicels 1-2, tomentose, in dense clusters near the ends of the branches. Outer Calyx-segments nearly glabrous, inner finely tomentose (Brandis). Calyx-lobes ⅓-½ in., ovate, subacute. Corolla ⅔ in.; lobes usually six, scarcely ¼ the length of the tube. Filaments hairy. Anthers 16, 2-serrate, subsessile, tips 3-toothed. The short mucronation of the

connective between the tips of the two cells giving this appearance more strongly than is indicated in the figure.

Fruit velvety when young, obliquely ovoid, 2-seeded, $1\frac{1}{2}$ in. long. The sweet fleshy flowers dried and eaten.

Uses:—It is astringent and emollient. Like *B. latifolia*, it yields two important products—a fixed concrete oil and a spirit, the former obtained by expression from the seeds, the latter by distillation from the flowers. The oil said to be good for skin diseases, flowers said to act as a mild laxative.

The gummy juice is used in rheumatism by Vaid. The bark in decoction as an astringent and emollient, and also as a remedy in itch (Ainslie.)

Economical uses of *Bassia longifolia* by Revd. Dr. John of Tranquebar.

1. The oil pressed from the ripe fruit is used by the natives as common lamp oil, who cannot afford to buy cocoanut oil. It is thicker, burns longer but dimmer, smokes a little, and gives some disagreeable smell which common people do not mind.

2. It is a principal ingredient in making the country soap, and keeps therefore often the same price with the cocoanut oil.

3. It is to the common people a substitute in place of ghee and cocoanut oil in their curries and other dishes. They make cakes of it, and many of the poor get their livelihood by selling these sweet oil cakes.

4. It is used to heal different out-breakings, such as the itch, &c.

5. The cake left after the oil is expressed, is used for washing the head, and is carried as a small article of trade to those countries where these trees are not to be found.

6. The flowers which fall in May are gathered by the common people, dried in the sun, roasted and eaten as good food. They are also bruised and boiled to a jelly, and made into small balls, which they sell or exchange for fish, rice, and various sorts of small grain.

7. The skin is taken off from the ripe fruit as well as the unripe, and after throwing away the unripe kernel, boiled to a jelly, and eaten with salt and capsicum.

8. The leaves are boiled with water, and given as a medicine in several diseases to both men and cattle.

9. The milk of the green fruit and of the tender bark is given also as a medicine.

10. The bark is used to cure the itch.

11. The wood is as hard and durable as *Teak* wood, but not so easily worked, nor is it procurable of such a length for beams and planks, except on clay-ground, where it grows to a considerable height, but in such a soil does not produce so many branches, and is less fruitful than when in a sandy or mixed soil, which is the best for them. In a sandy soil the branches shoot out nearer to the ground to a great circumference, and give more fruit. These

trees require but a little attention and watering during the first two or three years in the dry season, and being of so great use, we have here whole plantations of them on high and sandy grounds, where no other fruit tree will grow.

12. We may still add, that the owls, squirrels, lizards, country dogs and jackals, take a share in the flowers, but the report is that the latter, especially in the time of blossom, are apt to grow mad by too much feeding on them. (Roxburgh's *Flora Indica* pp. 410-411 Clarke's edition).

The kernels of *B. latifolia* yield to solvents 41 to 46 per cent. of a yellowish fat melting at 24° – 30° , and those of *B. longifolia* contain 54 per cent. or more. The acid values sometimes reach 70. The constants are: Specific gravity at 100° , 0.86; to 0.88; saponification value, 186–194; iodine value, 58 to 64; Reichert-Meissl value, 1.6 to 1.7. Fatty acids, 93.7 to 94.9 per cent., melting at 42° to 48° ; unsaponifiable matter, 1.4 to 2.2 per cent. The oil consists of olein and palmitin and probably stearin.

723. *B. butyracea*, Roxb., H.F.B.I., III. 546; Roxb. 411.

Vern.:—Chiúra, chaiura, bhulel (Kumaun); Cheuli (Oudh); Phalwara (Hind.); Chûri (Nepal); Yet, yelpote (Lepcha).

Eng.:—Indian Butter tree.

Habitat:—Sub-tropical Himalaya, from Kumaun to Bhotan.

A large deciduous tree, attaining 70ft. height, usually with a short trunk and rounded crown. Bractlets, petioles, under-side of leaves, stipules and pedicels, with fine silky hairs. Bark $\frac{1}{2}$ in thick, dark-grey. Wood light brown, hard. Leaves 13 by 6in., or smaller, firm, crowded near ends of branches, obovate, or obovate-oblong, elliptic or oblong-elliptic, sub-obtuse, base rhomboid, glabrous when mature or flocculose beneath; primary nerves 15-20 pairs. Petiole 1-1 $\frac{1}{2}$ in., stipules $\frac{1}{2}$ in., ovate-lanceolate, caducous. Pedicels 1-2in., very many, crowded among the subterminal leaves. Flowers in dense clusters at the ends of branches, drooping, tomentose. Calyx coriaceous, segments 4 or 5, $\frac{1}{4}$ – $\frac{1}{2}$ in. ovate, densely rusty tomentose inside. Corolla $\frac{3}{4}$ in. long, creamcoloured, fleshy, sweet, early caducous; lobes 8-10, spreading, short, erect. Stamens 30-40, says C. B. Clarke; 24-26, says Brandis; inserted at the mouth of the corolla tube; filaments glabrous, as long as the anthers. Anthers

exserted, linear-lanceolate, subsessile, hairy at the back. Ovary 7-9-celled. Berry 1 by $\frac{3}{4}$ in., ovoid, smooth, green, fleshy, 1-2 or 3-seeded. Seeds $\frac{1}{2}$ lin. long.

Uses:—It is used as an ointment in cases of rheumatism. The butter is an excellent emollient for chapped hands, &c., during the winter months. It seems deserving of further attention (Watt, I. 406).

The kernels yield from 60 to 65 per cent. of fat. The fat has a whitish colour and agreeable odour, and is used for edible purposes. It has been recommended for the preparation of ointments. The constants are: Specific gravity at 100°, 0.86–0.89; melting point, 39°; saponification value, 190 to 194; iodine value, 41 to 42; Reichert-Meissl value, 0.44 to 1.25. Fatty acids about 95 per cent., melting at 51° to 53°. The fat consists of the glycerides of oleic and palmitic acids and a small amount of phytosterol.

724. *Mimusops Elengi*, Linn., H.F.B.I., III. 548;
Roxb. 318.

Sans.:—Vakula.

Vern.:—Bakul (Beng.); Mólari (Hind.); Ghólsari, bhólsari (Dec.); Mogadam (Tam.); Pogada-mánu (Tel.); Elangi (Mal.); Bakuli, ovali (Bom.). Buckhul; ranjal (Kan.).

Habitat:—Deccan and Malay Peninsulas, frequently cultivated in North India.

A large, ornamental, glabrous, evergreen tree, 50ft. Bark dark-grey, rough, deeply cracked, with vertical or transverse fissures; wood very hard, close and even-grained. Sapwood reddish-brown; heartwood dark-red. Leaves $3\frac{1}{2}$ by $1\frac{3}{4}$ in., elliptic, shortly acuminate, base rhomboid, nerves slender, numerous horizontal, scattered, shining. Petioles $\frac{3}{4}$ in., youngest shoots, pedicels and outside of the calyx, with very short rusty pubescence. Flowers white, very fragrant, nearly lin., across, pedicels $\frac{1}{2}$ – $\frac{3}{4}$ in. Calyx segments 8. Corolla deciduous, leaves in 2 series, 16-20, narrow, lanceolate stamens 8, usually; staminodes 8, short, densely hairy on the back, acute, serrate or subentire. Berry 1-seeded, $\frac{3}{4}$ lin., ovoid, yellow. The fragrant smell of the Corolla persistent long after it dries.

Uses :—Chakradatta mentions the astringent properties of the unripe fruit, and recommends it to be chewed for the purpose of fixing loose teeth. He also mentions a decoction of the astringent bark as a useful gargle in diseases of the gums and teeth. In the Concan, a similar use is made of the unripe fruit, and the fruit and flowers, along with other astringents, are used to prepare a lotion for sores and wounds.

The author of the Makhzan says that the unripe fruit and seeds have powerful astringent properties, and that the decoction of the bark is useful as an astringent in discharges from the mucous membranes of the bladder and urethra, and also as a gargle in relaxation of the gums, &c. He mentions the use of a snuff made from the dried and powdered flowers in a disease called Ahwah, common in Bengal. The symptoms of this disease are strong fever, headache, and pain in the neck, shoulders and other parts of the body. The powdered flowers induce a copious defluxion from the nose and relieve the pain in the head (Dymock).

The bruised seeds are applied locally within the anus of children in cases of constipation (K. L. Dey).

The bark of this tree, much cultivated for the sake of its fragrant flowers, possesses, according to Horsfield (*Asiat. Journ.*, vol. vii., p. 262), astringent tonic properties. It is much esteemed by the Javanese, and is stated by the same authority to have proved useful in fevers, and as a general tonic. According to Dr. Bholanath Bose, a decoction of the bark forms a good gargle in salivation. A water distilled from the flowers is in use amongst the natives of Southern India, both as a stimulant medicine and as a perfume (*Ph. Ind.*).

The pulp of the ripe fruit is sweetish and astringent and has been successfully used in curing chronic dysentery (Surgeon-Major B. Gupta, in *Watt's Dictionary*).

The kernel is of a yellowish-brown colour, it has a very bitter taste, and is enclosed in a strong, glossy husk. The shells form 64 per cent. of the fruits. On extraction with ether, the kernels yielded 18·47 per cent. of a yellowish-brown viscid oil. The expressed oil has a light yellowish-white colour, and stearin deposits on standing. The oil is used for cooking, burning and in medicine.

The following physical and chemical characters were obtained of the fat : Specific gravity at 100°, 0·9129 ; acid value, 45·5 ; saponification value, 213·9 ; Reichert-Meissl value, 10·6 ; titration number of insoluble volatile acids, $\frac{1}{10}$ KOH 0·68 ; iodine value, 68·5 ; unsaponifiable matter, 1·56. Butyro-refractometer at 25° C., Degrees 73·5 ; at 40°, 67. Fatty acids : per cent. 89·4 ; melting point, 35° ; iodine value, 68·11 ; neutralisation value, 202·06. Mean molecular weight, 277·6. (A. K. Menon.)

725—*M. hexandra*, *Roxb.*, H.F.B.I., III. 549 ;
ROXB. 318.

Syn. :—*M. indica*, A. Do.

Sans. :—Rājādani.

Vern. :—Khirni (H.) ; Khirkhejur (B.) ; Ranjana, ráini (M.)
Rájan ; Kherni (Bomb.) ; Palla (Tam.).

Habitat :—Deccan Peninsula, extending North to Guzerat, Banda and the Circars.

A large or small, evergreen tree, sometimes shrub only, often gregarious. Trunk erect, the branches forming a large shady head. Bark grey, smooth, when young, often studded with branchlets and clusters of leaves, which degenerate into hard, conical, thorn-like protuberances. Wood red, very hard, close and even-grained ; in Ceylon, dark, vinous-red, purplish-black (Brown), (Gamble). Leaves wholly glabrous, shining, generally crowded at the ends of branchlets, ovate-oblong, obtuse, emarginate, 2-4in. long, 1½-2in. broad, base cuneate or rhomboid, coriaceous, nerves obscure. Petiole ¼-¾in., pedicels 2-5 together, nearly glabrous, ¼-½in., clusters sub-terminal and along the branches, often dense. Flowers ¼in. across, white or pale-yellow. Calyx-lobes 6, ⅙-⅓in., elliptic, subacute, obscurely tomentose, or nearly glabrous. Corolla ¼in. long. Stamens 6-8, anthers acute, as long as the filaments. Staminodes 6-8, serrate or lobed, glabrous, frequently bifid. Ovary 12-celled, hairy. Berry ½in. long., ¼in. broad. 1-sometimes, 2-seeded ; yellow when ripe, edible, rather sticky. Seeds yield an oil, says Gamble.

Uses :—The bark is used medicinally and is exactly similar to that of *M. elengi*. "The bark is much sought after for medicinal purposes and trees are often, greatly injured thereby." (Duthie).

In the Concan, the milky juice, made into a paste with the leaves of *Cassia fistula* and seeds of *Calophyllum inophyllum*, is applied to boils. The juice of a *Loranthus*, which grows upon the tree, is extracted by heat and given with long-pepper in cramp (Dymock).

The oil is used for medicinal purposes. It is yellowish and non-drying and deposits white fats at 30°. The specific gravity at 40° is 0.905, and the acid value, 25. The constants are: saponification value, 195.4; iodine value, 72.5; Reichert-Meissl value, 0.17. Fatty acids and unsaponifiable, 95; melting point, 38°; neutralisation value, 200.5; iodine value, 75.6.

726. *M. Kauki*, Linn. H.F.B.I., III. 549; Roxb. 318.

Sans:—Ksheerika.

Vern.:—Ksheerni (B); Kheeri, Chirui (H.); Manilkara (Mal.); Adoma (Goa); Kanki (Mar.).

Habitat:—Occasionally planted as far west as Hoshiarpore, Multan, Lahore, and Eminabad, near Gujranwala. Native of Burma and Malacca, grows in Ratnagiri and Ghatkoper.

A large tree. Leaves 4 by 2 in., obtuse or scarcely acute, obovate-elliptic, or obovate, densely silky, white beneath, base cuneate, nerves obscure. Petiole 1-1½ in. Pedicels lin., densely clustered near the ends of the branches, cinnamoneous-tomentose. Calyx-lobes 6, ¼ in., ovate, subacute, brown, tomentose. Corolla ½ in. long, lobes narrow acute. Stamens 6-8. Staminodes 6-8, serrate or lobed. Berry ¾ lin., globose smooth. Seeds usually 3-4.

Uses:—The seeds made into powder are used in ophthalmia, and also employed internally as a tonic and febrifuge; and the root is officinal at Lahore (Stewart). The seeds are considered hot and moist, and are prescribed in leprosy, thirst, delirium and disorders of the many secretions. They are also considered anthelmintic (Baden-Powell).

The fruit is very sweet and pleasant. The milk of the tree is used in inflammation of ear and conjunctivitis, &c. (Dr. Emerson).

The root and bark are believed to be astringent and given in infantile diarrhœa, after being ground with water and mixed

with honey. The leaves, boiled in gingelly oil and added to the pulverised bark, are considered a good remedy in Beri-beri. The bark is astringent, and yields a kind of gummy fluid. Leaves, ground and mixed with turmeric and ginger, are used as cataplasms for tumors (abscesses?) (Drury).

N. O. EBENACEÆ.

727. *Diospyros montana*, Roxb. H.F.B.I., III. 555 ;
ROXB. 415.

Vern. :—Tendu, bistend (Hind.); Neori, bhoori (Bundelkhand); Hirek, keindu, temru, pasendu (Pb.); Makar-tendi, banda, muchi tanki, yerra goda (Tel.); Tembhurni, govindu, lohari (Mar); Tendu, bulguni, Kalagunda, (Kan).

Habitat :—From the Himalaya, throughout India (except Sindh and Northern Punjab).

A large shrub, or small deciduous tree, often spinous. Trunk usually crooked covered with dark rust colored nearly smooth bark. Branches sometimes spinescent. Branchlets and young leaves softly tomentose; branchlets soon glabrous. Bark thin, grey or greyishblack, rough, when old, exfoliating in small scales. Wood grey, often tinged with yellow or brown, streaked with narrow patches or darker colour, especially towards the centre, but no regular ebony; heartwood soft to moderately hard. Graham Anderson says, from Mysore, that the wood is difficult to cut with the axe (Gamble). Leaves bitter (Kanjilal), thinly chartaceous, ovateoblong, base rounded or cordate, blade 2-4in., petiole slender, $\frac{1}{2}$ - $\frac{1}{4}$ in. long, secondary nerves 6-8 pair, slender; "usually glabrous, sometimes pubescent beneath; or on both sides, venation in conspicuous beneath" (Trimen). Flowers white, as a rule, 4-merous. Male flowers velvety, shortly pedunculate, or nearly sessile, usually 2-8fid, segments obtuse, velvety on both sides. Corolla $\frac{1}{4}$ in. long, campanulate, outside glabrous or pubescent; lobes short, spreading. Stamens 16, in opposite pairs, united at the base, the outer longest. Anthers lanceolate, awned, glabrous. Female flowers axillary, solitary, drooping, on short pedicels. Calyx segments ovate, $\frac{1}{4}$ in. long. Corolla nearly glabrous out-

side. Staminodes 4. Ovary glabrous, 8-celled. Fruit bitter, not edible, $\frac{1}{2}$ -lin. diam., yellow when ripe, supported by the enlarged foliaceous Calyx-lobes. Albumen uniform (Brandis).

Use :—The fruit is supposed to be poisonous. The *bhistis* apply it to boils which generally appear on their hands and give them much pain and trouble (Stewart).

728. *D. Embryopteris*, Pers., H.F.B.I., III. 556.

Syn. :—*D. glutinosa*, Kæn; Roxb. 413.

Sans :—Tinduka.

Vern. :—Gáb, makur-kendi (Beng. and Hind.); Abnos-e-hindi (Arab.); Tendu (Ass.); Tumbika, pani-chika (Tam.); Tumik (Tel.); Timboree, temburni, (Mar); Kusharta, hagna, huli tumri, gavandu (Kan).

Habitat :—Very common throughout India; abundant in Bengal.

A much-branched, dense, evergreen tree, of middle size. Buds silky, with appressed hairs. Branchlets glabrous. Bark smooth, dark-grey, almost black, with green tinge, exfoliating in large pieces. Wood grey, with darker streaks and darker, irregular patch in the centre (heartwood?), moderately close-grained (Gamble). Leaves distichous, $5\frac{1}{2}$ by 2 in., coriaceous, glabrous, shining, oblong, obtuse at the base, subacuminate, primary nerves oblique; reticulating nerves distinctly, slightly, elevated on both sides; petiole $\frac{1}{4}$ - $\frac{1}{2}$ in long, wrinkled when dry. Flowers as a rule 4-merous, white, cream-coloured, sweet scented. Maleflowers in short axillary pedunculate cymes, 1- $\frac{1}{4}$ in., of 3-6 flowers. Calyx hairy, cup-shaped, lobes $\frac{1}{2}$ - $\frac{1}{4}$ in., triangular. Corolla tubular-campanulate, nearly glabrous without, $\frac{1}{2}$ by $\frac{1}{2}$ in., lobes $\frac{1}{10}$ in. Stamens 24-64 in pairs, at the base of the corolla tube or on the receptacle beneath, subequal; filaments short, hairy, anthers hairy, linear, much longer than the filaments. Female flowers larger, usually solitary sometimes in pairs (Brandis), 1-5 together, says C. B. Clarke subsessile or cymose, resembling the male. Calyx-lobes cordate, wider, subauriculate at base. Ovary hairy when young, glabrous when maturing, 8-celled. Styles 4, lobed at the tips; stigmas lobed. Fruit usually solitary,

1-2in. diam., yellow and sweet when ripe, subglobose, glandular or rusty, usually 4-8-seeded; seeds embedded in a viscid pulp. Fruiting Calyx persistent, $\frac{2}{3}$ in. across, lobes patent, villous within.

Uses:—The fruit and the bark possess astringent properties. The juice of the unripe fruit makes a good application to fresh wounds. It is full of tannin, and is therefore a useful domestic astringent, so plentiful as to be at the door of even the poorest hut. An oil extracted from the seeds is also used in native medicine, in dysentery and diarrhoea with success. Bark is used in intermittent fevers (Honnigberger).

It is used in dysentery and diarrhoea with success. The infusion of the fruit is used as a gargle in aphthæ and sore-throat (Kanai Lal De Bahadur).

The seeds are preserved by the country people, and given as an astringent in diarrhoea (Dymock).

It is official in the Pharmacopœia of India.

729. *D. melanoxyton*, Roxb., H.F.B.I., III: 564; Roxb. 412.

Syn.:—*D. Wightiana*, Wall.

Sans.:—Kakundoo.

Vern.:—Tendu, kendu, abnú (Hind.); Kend, kyou (Beng.); Tumri, tummer, tumki (Gond.); Tumbi, tumbali (Tam.); Tumi, tumki (Tel.). Tamrug (Guz).

Habitat:—Deccan Peninsula.

A large, or moderate sized, deciduous tree, attaining 50ft., and 6ft. in girth, greyish black, cleft into small rectangular plates, showing the black inner bark in the clefts. The bark shows alternate layers of brown and black, so that as it wears the surface shows partly of either colour. Wood hard, reddish-brown, with an irregular black heartwood. Young parts covered with grey or rusty tomentum. Leaves alternate and subopposite, says Kanjilal; mostly opposite, says Brandis; thickly coriaceous, hairy or glabrous on the underside when full grown, elliptic or ovate; blade 3-12in., petiole $\frac{1}{2}$ in., secondary nerves 6-10 pair, as well as the reticulate tertiary nerves raised on the upper side.

Flowers 4-6-merous. Males on short cymes, calyx woolly, campanulate or cup-shaped. Corolla tubular, ferrugineous, woolly outside, stamens 12-16. Female flowers solitary, larger than the Calyx, broad, edges recurved; ovary 4-8-celled, densely hairy; styles 2-3. Fruit glabrous, smooth, globose, or ovoid, 1-1½ in. diam., yellow, edible when ripe, supported by the thickly coriaceous Calyx, the segments with more or less recurved edges. Seeds 4-8, compressed, oblong; testa rugose, shining, albumen ruminant. Pulp yellow, sweet-aromatic, slightly mucilaginous, particularly near the testa of the seed.

Uses:—The bark of the tree, possesses astringent properties, and is used as decoction in diarrhoea and dyspepsia as a tonic. In a dilute form, it is used as an astringent lotion for the eyes.

The Hakims apply its powder in ulceration of the cornea and recommend it internally with black pepper in dysentery (Honnigberger).

N. O. STYRACEÆ.

730. *Symplocos cratægoides*, Ham. H.F.B.I., III. 573.

Vern.:—Lú, lándar, loj, losh (Pb.); Lodh (Kumaun); Loja (Sutlej); Lodur; Pathani lodh (Sind.).

Habitat:—Himalaya, from Kashmir to Bhotan; Khasia.

A large shrub or small tree, deciduous. Bark light-grey, corky, with long vertical cracks. Wood white, soft to moderately hard, close-grained, splits and twists in seasoning. Branchlets and leaves hairy. Leaves 2-4 by 1-1½ in., broad elliptic or ovate, acuminate, sharply glandular, serrulate towards the apex, membranous, pilose beneath or glabrescent; petiole ½ in. long. Flowers white, ½ in. diam., fragrant, in cymose corymbs, forming dense terminal or axillary panicles; bracts small, linear, caducous. Calyx turbinate, lobes ciliate. Corolla 5-cleft nearly to the base. Stamens indefinite 20-60, equalling the corolla in length, connate, in 5 bundles. Ovary inferior, 2-celled, glabrous or hairy. Fruit ½-¾ in. long, obliquely ovoid, or obovoid, crowned with remains of

the Calyxlimb, usually 1-seeded, black when ripe, embryo curved, oxile (Kanjilal).

Use:—The bark is considered tonic. It is also used in ophthalmia (Dr. Stewart).

731. *S. racemosa*, Roxb. H.F.B.I., III. 576, ROXB. 415.

Sans.:—Lodhra.

Vern.:—Lodh (H. and B.); Chamiani (Nepal); Palyok (Lepcha); Kaiday (Mehi); Singyan (Bhutia).

Habitat:—Throughout North-East India, common from the Terai of Kumaun to Assam; common throughout Chota Nagpore.

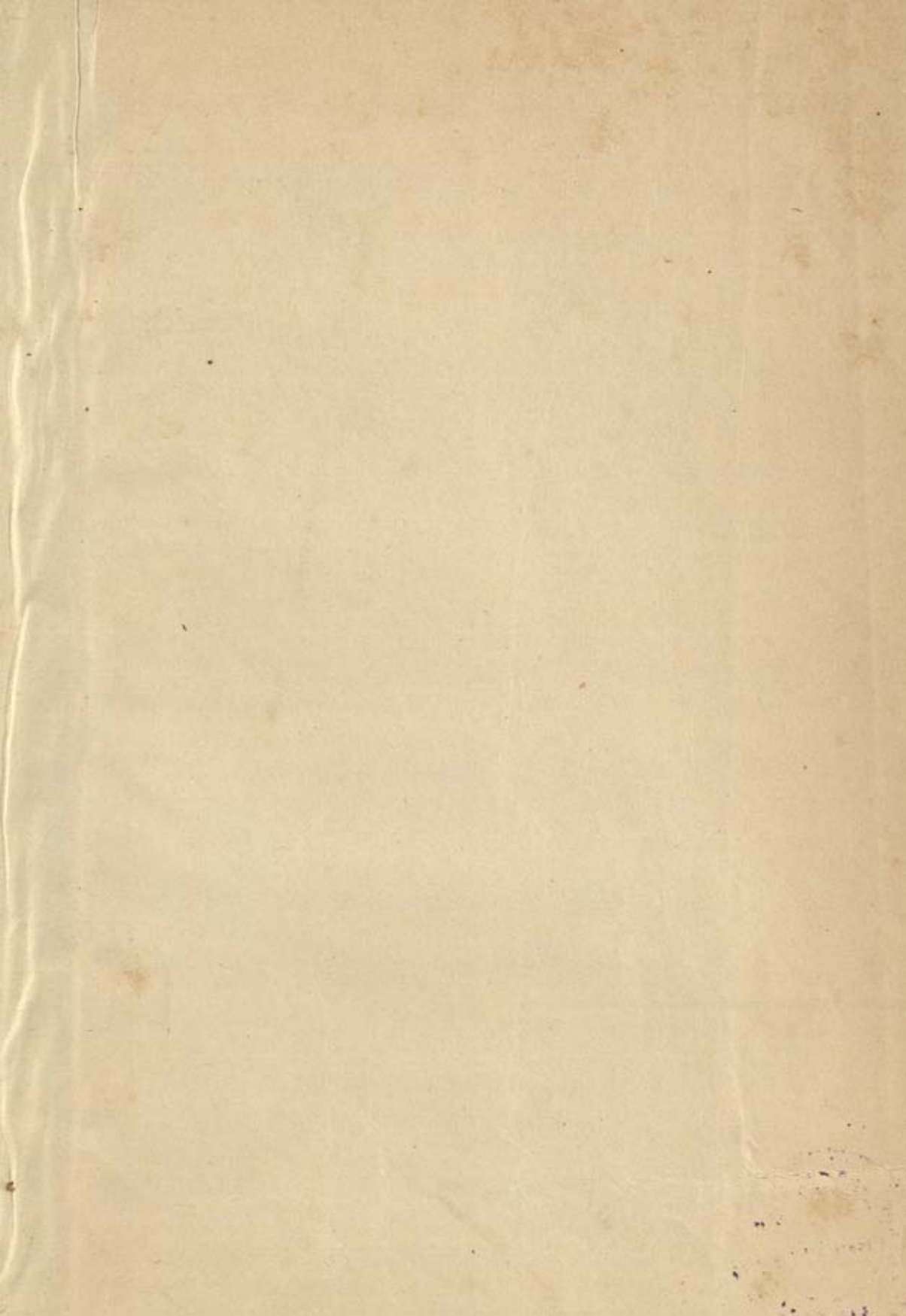
A small evergreen tree. Bark soft. Branchlets soon glabrous. Leaves glabrous, coriaceous, elliptic-lanceolate, obscurely crenate. Blade 4-6 in. Petiole $\frac{1}{2}$ - $\frac{2}{3}$ in. Flowers yellow, fragrant, in simple hairy axillary, more or less lax racemes; pedicels as long as Calyx-tube, which is glabrous; lobes rounded, equalling the tube, slightly pubescent and with ciliate edges. Stamens about 100-115. Disk glabrous. Corolla 3 times longer than calyx. Fruit cylindric, nearly $\frac{1}{2}$ in. long, smooth, 1-3 celled. Calyxrim nearly as wide as the fruit, with erect teeth. Ovary 3 celled, hairy. Embryo straight.

Uses:—In Hindoo medicine, the bark is described as cooling, astringent, and useful in bowel complaints, eye diseases, ulcers, &c. A decoction is used as a gargle for giving firmness to bleeding and spongy gums (Dutt).

It is often used in Bombay in the preparation of plasters (*lêp.*); it is supposed to promote the maturation or resolution of stagnant tumors (Dymock).

Drs. Charles and K. L. Dey, recommend the bark in 20 grain doses mixed with sugar, as a remedial agent in menorrhagia due to relaxation of the uterine tissue; it should be given two or three times a day, for three or four days. Dr. K. L. Dey considers that the drug has a special action upon relaxed mucous membranes.





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